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ABSTRACT

This publication celebrates the "diamond jubilee of the Mississippi Valley Industrial Teacher Education Conference (MVITEC) and is only the second to be based upon conference presentations in the organization's 75-year history. The following papers are included: "The Mississippi Valley Conference" (Evans); "What Has Made the Mississippi Valley Industrial Teacher Education Conference Effective?" (Wolansky); "The Conference and the Literature of the Field" (Stephens); "Technology Education: The Culmination of a 79-Year Quest" (Lemons); "Evaluation of Our Profession over the Past 25 Years: Quantitative and Qualitative Measures" (Dugger); "Research Methods in Industrial Education: Heritage and Prospect" (Pannabecker); "Teaching Social Values of Work in Industrial Education" (Bjorkquist); "Rationale, Basic Assumptions, and Content of Industrial Arts Education, Industrial Technology Education, and Technology Education" (Savage); "Technology Education: Its Response to Change and to Societal Needs" (Bender); "Technology Education as a Part of Undergraduate Liberal Education" (Wiens); "Twenty-Five Years of Change (1963-1988) and Its Effect on Industrial Teacher Education Administrators" (Rokusek, Israel); "Conceptual Models and Strategies for Developing Technology Education" (Bensen); "Industrial Teacher Education 1988-2000" (Lauda). Also included in the book are the membership rules and regulations of the MVITEC, the membership roster of the MVITEC on September 1, 1988, and comments on the members' installation ceremony by Wolansky. (CML)

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At the 75th Conference
of the

Mississippi Valley Industrial Teacher Education Conference

St. Louis, Missouri
November 10 and 11, 1988

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Daniel L. Householder
Editor
Texas A&M University
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FOREWORD

The idea for this publication first surfaced at a business meeting of the Mississippi Valley Industrial Teacher Education Conference (MVITEC), as the members explored ideas for the 75th Conference. The only previous publication based upon Conference presentations was issued in 1934, when the 25th Conference was held at Bradley Institute, Peoria, Illinois. Several members expressed the idea that it would be most appropriate for the group to make the presentations at the 75th Conference generally available to the profession.

Individual MVITEC members were invited to submit proposals for papers to be presented at the 1988 Conference and to be published in a special volume to commemorate the 75th Conference. (This was a reversal of the typical MVITEC procedure; presentation topics are usually assigned to members.)

As the project began to take shape, its scope expanded beyond the financial capability of MVITEC, and a proposal was submitted to the Technical Foundation of America asking for support to underwrite the costs of publication and distribution. We are deeply indebted to the Foundation for its generous support, which has enabled us produce this handsome publication, to provide copies to members and guests at the 75th Conference, and to distribute the volume to departmental and institutional libraries of colleges and universities which offer industrial teacher education programs.

In editing this group of papers, every attempt has been made to preserve one of the most honored traditions of MVITEC: free and open discussion without pressure to compromise or to agree. While the authors have been encouraged to clarify their arguments, build their cases well, and provide the best possible examples, the editorial prerogative has not intentionally impinged upon their positions. The topics were proposed by the authors, who prepared their papers in their chosen patterns, with only minor editorial nudging to bring them into a semblance of stylistic consistency. The ideas expressed and the terminology chosen by the authors are theirs alone. Even the name of the Mississippi Valley Industrial Teacher Education Conference has been expressed differently by the respective authors; that independence of terminological viewpoint has been retained in the publication.

As the work of this distinguished group of authors goes to press, there is heightened anticipation for the impact their outstanding work will have at the 75th Conference and in subsequent discussions throughout the profession. We are indebted to each of them for their careful scholarship, creative thought, and dedicated commitment to their professional ideals.

On a personal note, it has been my highest professional honor to serve the Mississippi Valley Industrial Teacher Education Conference and to follow in the traditions established by those who have chaired the group since its inception. The opportunity to work with these authors to prepare this publication has been the highlight of my MVITEC involvement. My personal thanks to each of them for their dedication to the challenging task of preparing excellent papers while meeting a demanding publication schedule.

Special appreciation is expressed to Rupert N. Evans and Wesley D. Stephens for the helpful editorial advice which they provided (in addition to the preparation of their own invited papers.) This project owes much to the efforts of G. Eugene Martin, who chaired the MVITEC committee which recommended the development of a publication of the papers presented at the 75th Conference, who encouraged the submission of a proposal for funding to the Technical Foundation of America, and who has maintained a deep personal interest in the project. My personal thanks to him for his encouragement throughout the endeavor. Appreciation is also expressed to Texas A&M University for its support of this effort, in addition to its long-term support of my work for the Conference.

Daniel L. Householder
College Station, Texas
September 1, 1988

THE MISSISSIPPI VALLEY CONFERENCE

Rupert N. Evans
Professor Emeritus of Vocational and Technical Education
University of Illinois

The Mississippi Valley Industrial Teacher Education Conference has been in existence for 75 years. It was planned in 1908, and an exploratory meeting was held in 1909, but the organizational meeting which began three quarters of a century of continuing influence in industrial education took place in 1913. This document celebrates our diamond jubilee.

I claimed in 1979 that the Conference has been "one of the most influential agents for formulating and disseminating goals and programs for industrial arts" (p. 413). I noted that its influence

> persists in spite of the fact that it has never officially held the name by which it is most widely known, does not include the entire Mississippi Valley, has no dues or paid staff, has no written journal or newsletter, and has refused for many years to adopt a formal position on any topic. (p. 413)

This claim appears to be as valid today as it was a decade ago.

The Founders and the Founding of the Conference

The Midwest has been the strongest supporter of industrial education in the United States and is the cradle of industrial teacher education. No other part of the world has such a concentration of institutions with strong industrial teacher education programs.

The impetus for the development of industrial education came from the determination of a few pioneers to redesign the high school curriculum. Midwesterners in particular were not satisfied to have only 5% to 7% of their children graduate from high school, and were convinced that the curriculum was a major factor causing students to drop out of school. Not only was the curriculum inflexible, but also it appeared to students to have little relevance to the new industrial age which was transforming the country into one of the world's great producers of manufactured goods.

Manual training was a major early addition to the curriculum. It sought to develop the hand as well as the mind, and gave elementary and secondary school students a blessed relief from hours of sitting or standing at attention, rote recitation, and a curriculum which was based almost entirely on the past. There is little doubt that it encouraged many students to stay in school. At the same time it encouraged taxpayers to support high schools which taught at least a few things that were more relevant to life than the traditional Greek and Latin.

The National Society for the Promotion of Industrial Education (NSPIE) was formed at nearly the same time as the Manual Arts Conference of the Mississippi Valley. In its early days, it was controlled primarily by business men who felt that manual training was useless for vocational purposes. They felt that "real vocational education" was much to be preferred, and that it would cost little if anything more, because it could use the funds being spent on manual training and manual arts.

Bawden, writing in 1950, did not call them business men, however. He believed that the NSPIE

> was financed and controlled by eastern men [who] seemed ignorant of and indifferent to . . . public education in the middle west . . . certain eastern leaders were not hospitable to the interests of manual training (now industrial arts), but were critical and even scornful of its educational values, and disposed to eliminate it entirely from the schools. (p. 174)

Bawden's "eastern leaders" probably were David Snedden of Columbia University and his allies, who were intent on building separate secondary schools for vocational education. They believed that comprehensive high schools would inevitably be dominated by the classicists, who would use vocational funds on play-like activities taught by persons who had no trade experience (Drost, 1967). However, Bawden knew that it was

> common to find in the middle west the conviction that the quickest, most economical and most efficient way to develop a program of vocational education is to build it on a foundation of strong courses in industrial arts, home economics, commercial subjects, and other practical activities in the [public] elementary and high schools. (1950, pp. 174-175)

Bawden, who worked for United States Commissioner of Education, Philander P. Claxton, was assigned in 1913 to work closely with the Mississippi Valley Conference. Claxton probably wanted to give prominence to the views of these Midwesterners to offset the convictions of the NSPIE. Certainly his decision to publish Conference reports as official government bulletins was as unusual as it was for him to spend part of his very limited budget to pay Bawden's expenses for annual trips to Conference sites in the Midwest.

In 1920, Claxton attempted to bring together the National Society for Vocational Education (which had replaced the NSPIE) and the Vocational Education Association of the Middle West (in which many Conference members were active). Drost suggested that this was an attempt to "temper the extreme approach of the Easterners with the more moderate views of the middle west association" (1967, p. 158). This implies that Claxton and his successors saw the Conference as a means of furthering their own ideas. However, Bawden was an able advocate who probably took many Conference views back with him to Washington. Certainly he played a major role in the merger of the NSVE and the VEAMW to form the American Vocational Association, and he also worked closely with Selvidge to found the Industrial Arts Division of AVA.

No one knows the extent to which the Conference was influential in securing acceptance for industrial arts on the east and west coasts. In 1950, Bawden credited "experience," rather than the Conference, as the factor which changed their minds:

> In later years the eastern leaders were forced by the lessons of experience to acknowledge the contribution to vocational education made by well-organized programs of industrial arts, and their attitude became somewhat more cordial. But there never has been any adequate public explanation for the obstinacy with which the initial determination to eliminate all manual training from the schools in favor of 'honest-to-god' [*sic*] vocational education was adhered to for so long. (p. 175)

Charles A. Prosser succeeded Snedden as head of the NSPIE and was the first head of vocational education in the Federal Government. He and Claxton were bitter enemies, but agreed that vocational education should have separate status, rather than be a part of the Office of Education. London remembered that Prosser "once told me that for years he honestly believed that genuine vocational education could not be thoroughly established in the schools without elimination of manual training" (Personal communication, 1977). The Midwestern successes in using manual training, industrial arts, and vocational industrial education to complement each other changed his mind.

In 1913 the Conference developed a proposal for a four-year teacher training program which would prepare teachers for both vocational industrial education and for manual arts. Bennett was sure that genuine tradesmen could not be attracted away from industry because of the low salaries available for teachers. He felt that this was particularly true of tradesmen who were thoroughly experienced and had the broad knowledge needed by a trade teacher. Thus, he believed that vocational education was doomed to attract only narrow specialists and failures from industry unless alternative methods of training teachers could be developed by colleges and supplemented by a year or so of practical shop experience. This was anathema to the Easterners, though they generally came to agree that tradesmen needed a bit of pedagogic training.

The other major group challenged by the Conference was comprised of those industrial arts teacher educators who sought their content from any source other than trade and job analysis. Many Conference members believed that William E. Warner (of The Ohio State University) and his disciples were intent on de-emphasizing skill development to the detriment of sound industrial arts.

Warner received his doctorate from Columbia, where he studied with Snedden and others of the "Easterners," and agreed with them that vocational education and industrial arts should not co-exist in the same school. It was not until the mid-1950s that most Conference members became active in the American Industrial Arts Association (which was founded by Warner), and some of the early members of the Conference never did.

Early Industrial Teacher Education

Many colleges established departments for developing teachers of manual training before 1908. Most of these were in the Midwest, for example, in Illinois (at Macomb, Normal, Peoria and

Urbana), in Indiana (at Terre Haute), in Iowa (at Cedar Falls), in Missouri (at Columbia), and in Wisconsin (at Menomonie). In addition, the public schools in several cities, including Chicago and Indianapolis, established programs to develop manual training teachers and to retrain teachers of other subjects because the colleges could not prepare manual training teachers rapidly enough to accommodate the large numbers of students who wanted to benefit from the changing curriculum emphasis.

It seemed to Charles A. Bennett, who headed the manual training teacher preparation program at Bradley Institute in Peoria, that if the heads of these manual training programs could "get together in close conference . . . they could express all their heresies without being reported in the educational papers and exchange views on questions of vital importance." (Bawden, 1930, p. 10). He explored this idea with Robert A. Selvidge of the University of Missouri, and offered to hold such a conference in Peoria. It took place in the second week of November, 1909, and included representatives of each of the programs mentioned above.

Subjects Covered and Name Changes

Although the invitation to the 1909 conference stated that it was addressed to a few "teachers and organizers of manual training" (Bennett, 1937, p. 502), the conference program did not use the term "manual training." Instead, it referred consistently to "manual arts," a term which was coming into use to emphasize manual training for general education. However, the older and more prevalent phrase, "manual training," which did not distinguish between training the hand for vocational or general education purposes, often appeared in subsequent conference programs. Gradually, it was replaced, first by "manual arts," then by "industrial arts."

At the 1913 conference, the group decided that its name should be "A group of men from institutions in the Mississippi Valley engaged in training teachers of manual arts." This phrase was far too long for common use, and the group began to be called "The Mississippi Valley Manual Arts Conference," or just "The Mississippi Valley Conference."

Many people have believed that the Conference has been concerned only with general industrial education because "Manual

Arts" appeared in its original title. However, beginning with the second meeting, a major portion of almost every program was devoted to the training of trade teachers for vocational schools. Indeed, the Conference members suggested that their collegiate programs could provide all the preparation needed by such teachers except for "the trade experience and [college programs such as ours] can go a long ways in that direction" (Bennett, 1914, p. 3). This point of view was never popular with vocational industrial educators east of Appalachia and west of the Rocky Mountains, but it reflected reality in the small cities of the Midwest, where the same teacher often taught a half day each in general and in vocational industrial education programs, and many students enrolled in both programs, often concurrently. Moreover, many of these teachers secured their pedagogic training for both vocational and general industrial teaching in the college departments whose heads made up the Mississippi Valley Conference. Naturally, these department heads were interested in both aspects of the program.

Not everyone agreed, of course. Warner and his followers maintained that industrial arts teacher education would be contaminated if it were taught in the same department which trained trade and industrial teachers. On the other hand, many state directors of trade and industrial education felt that this vocational field inevitably would be diluted if its instructors were taught by the same people who taught teachers of industrial arts. The Mississippi Valley Conference solved this problem neatly by refusing to invite the most outspoken advocates of these two divergent points of view to become members of the Conference. This is not to say that discussions within the Conference on this point were ever mild.

The term "industrial arts" gradually replaced "manual arts" in general usage during the 1920s and 30s, but the Manual Arts Conference of the Mississippi Valley retained its original name, using the old term until 1946. In that year, C. Kenneth Beach of Cornell University announced that he would no longer ask his Dean for permission to attend a conference with an obsolete name. This appeal persuaded the other members to replace "Manual" with "Industrial" in the Conference name. Actually, the name became the "Mississippi Valley Industrial Arts Conference."

The most recent name change occurred in 1973 when a committee chaired by Ralph Wenrich of the University of Michigan recommended, and the Conference adopted, the name "Mississippi Valley Industrial Teacher Education Conference" (MVITEC). This change acknowledged that since 1913 the primary concern of the discussions had been teacher education, though the Conference name had never reflected this fact. Moreover, the Conference programs and discussions frequently had covered both general and vocational industrial teacher education, though the Conference name had never mentioned the latter.

Oddly, no sooner had the name been changed than the amount of time devoted to vocational teacher education programs began to decline. Now, most attention is focused on teacher education for technology education, industrial technology education, and industrial arts education. Even the training of technologists in baccalaureate programs receives much more emphasis than does vocational industrial teacher education.

This shift of emphasis probably reflects the changing job responsibilities of the members. To qualify for active membership in the Conference a person must be: a. the administrative head of an industrial teacher education program in an institution of higher education; or b. head of industrial education in a state department of education. Some 90% of the members are from higher education.

During the 1970s, there was a precipitous decline in enrollment in baccalaureate programs for vocational industrial teachers because the enrollments in vocational industrial and technical education were shifting from the secondary schools to the community colleges, which did not require their teachers to have pedagogic training. At the same time, the decline in enrollment in baccalaureate programs for industrial arts teachers was almost as great, but in this case the causes were declining high school enrollments and the shift of many of the remaining students from the general curriculum to the college preparatory curriculum. Simultaneously, enrollment in baccalaureate programs for training technologists expanded markedly.

Many of the older members of the Conference were asked during the 1970s to become deans of new schools or colleges which had responsibility for training both technologists and industrial education teachers. Most of them were replaced in the

Conference by department heads who had responsibility only for industrial teacher education. These new members have tended to place highest priority on discussion of industrial arts/technology education and second priority on the booming four-year collegiate programs for training technologists. As a result, vocational industrial education in the high school has received less and less attention in Conference sessions, and the vocational and technical education programs in community colleges have been mentioned hardly at all.

Membership in the Conference

"Once a member, always a member of some type" is a conference rule, but membership is not as casual as this phrase would seem to indicate. Induction into active membership follows a relatively rigid pattern. A candidate must apply for membership. The membership committee carefully reviews each application, checking particularly to see that evidence is presented to show that the applicant:

1. Is the administrative head of a collegiate industrial teacher education program or of a state department of industrial education in one of 20 named states in the valley of the Mississippi. (For some reason, Colorado, New York, and Pennsylvania are now excluded, though a part of each state is drained by the Mississippi, and at one time each had one or more members);
2. Is in a continuing administrative role (a department head who holds a short term of office, and expects to rotate out of this post is not welcomed to membership);
3. Has attended at least one previous Conference as the guest of a Conference member; and
4. Is not from an institution which already has an active member.

For many years, 5% to 10% of the members were supervisors of industrial education in city schools. As these members left the Conference, after World War II, they were not replaced. A similar proportion of members have been publishers of professional books and magazines. This proportion is also declining, to the detriment of the quality of discussion and of the literature. Wesley D. Stephens' paper on "The Conference and the Literature of the Field" describes this phenomenon further.

For the past fifteen years, another avenue of induction has lead to Active-At-Large membership. All of the requirements for active membership which are listed above are waived, but the person must be a nationally known leader in industrial teacher education who will make a major contribution to the discussions of the Conference.

Active Members who move out of administrative roles become Associate Members. Members who miss three consecutive Conferences and Active Members who move out of the Conference area become Former Active Members. The membership roster also includes Former Active Members, Deceased. Thus it is literally true that "once a member, always a member."

The Conference membership currently is restricted to a maximum of 65 Active Members and five Active-At-Large Members. The numbers have changed slightly from time to time, but most of the procedures for admission of members have existed for the past 75 years. Three major procedural changes have occurred, however.

1. In 1913, it was decided that the primary focus of the Conference would be on teacher education, rather than on teaching. This emphasis continues today.

2. Another major change occurred in 1913, with the decision to admit only one person per institution. This rule also continues. The assumption was that the head of the department which was responsible for industrial teacher education would be the institutional representative, but occasionally, a former administrator would bar his successor by holding on to the active membership. A rule change in the 1970s now automatically moves former administrators to associate member status.

3. The latest major change came in procedures for selection of new members. Until 1972, a single "blackball" was enough to keep a person from becoming a member, and at least one leader in the field, William E. Warner, never became a member for this reason. No one knows who objected, but Arthur B. Mays told me in 1950 or 1951 that Warner was not admitted because he would have dominated the discussion so completely that other members would have been shut out. Probably another reason was that most members did not accept Warner's ideas about the restructuring of industrial arts. Now, a two-thirds vote of the membership is required to admit a newcomer, but members take this vote seriously, and applications are often eliminated by the membership committee, usually because of failure to meet the stated requirements for membership.

Most of the few female industrial teacher educators in the Midwest have attended the Conference as guests, but none has met the requirements to become an active member. It seems certain that as soon as a female becomes a department head, she will be elected to active membership, but no one knows when that will occur.

The limitation on the number of members was imposed presumably to ensure ample opportunity for discussion. Actually, it rarely has been a bar to membership because the number has been raised if many eligible people are on the waiting list. It helps to create an aura of exclusivity, however, and, combined with the requirement for attendance has kept interest in the organization high.

Another major reason for the success of the Conference is the ratio of presentation time to discussion time. Almost every convention program fills its time with presentations. Perhaps a maximum of 10% of the program time is allowed for questions and discussion. In contrast, the Conference program typically allows twice as much time for discussion as for presentation. Members state repeatedly that they believe this is one of the strongest features of the Conference.

Organization of the Conference

The Conference meets annually during the second week of November. It alternates its meetings between Chicago and St. Louis, and meets in a downtown hotel. For the past thirty years, those members whose wives do not accompany them to the Conference have sought regularly to meet in an airport hotel, but so far they have been outvoted.

The administration of the Conference is an interesting mixture of democracy and autocracy. Each year, members are asked to suggest topics for discussion for the following year. These are catalogued and combined by the General Chairman and put in the form of ballot. Each active member is asked to select the four or five topics he would most like to see on the program the following year. He is also invited to suggest the names of members who could give an effective presentation on each of these topics.

The General Chairman then tallies the votes and forms a two-day program, inviting individual members (active and associate) to make presentations. Rarely, a non-member is invited to speak. It is a Conference rule that when one is asked to make a presentation, the invitation is accepted, with only real emergencies allowing a refusal. It is common for approximately half of the presentations to be given by new members, who thus get a rapid initiation through the group's questions and the discussion that follows.

The autocracy exists because the General Chairman decides the program. Chairmen rarely have flouted a vote of the Conference, but the manner of wording the program ballot and the program, and the decisions about who will make a presentation on which topic present considerable scope for control. None of the Chairmen appear to have let their biases affect the conference program consciously.

The General Chairman is usually called the Permanent Chairman or Life Chairman. Presumably he could continue to serve as long as he lived, if he chose to do so, because his Chairmanship has no term. Actually, however, these leaders usually leave the chair soon after retirement from their full time jobs, and the last three Chairmen are still alive.

Five persons have served as General Chairman of the Conference. Actually, the first chairman was Charles A. Bennett, who called the first meetings, chaired them, and wrote the meager reports which emerged. However, he never assumed the formal title, and in his writings always referred to Bawden as the first chairman. Each chairman has served as arranger and facilitator of the meetings, but beginning with Bawden, most of the sessions have been chaired by other members, while the General Chairman works in the background. Perhaps once in each meeting the General Chairman speaks out on matters of importance to him which he feels are also for the good of the order. A few other members also indulge in this practice, but the membership tends to be less kind to them than to the General Chairman, and to remind them that their preaching is interfering with discussion.

William T. Bawden served longest as General Chairman (1914-41), and did more to shape the Conference than any other individual. He instituted the policy that written reports were to accompany oral presentations, and insisted that regular attendance was essential to continued membership. He arranged to have Conference reports receive wide circulation by publishing them as U.S. government publications. London said,

> Bawden was above everything else an organizer par excellence. He ran the Conference like he had been ordained by God to do it, and everybody seemed to like it. His enthusiasm and promptness permeated the Conference from the beginning until the last (London, 1977).

Verne C. Fryklund (1946-61) emphasized the importance of curriculum materials and was vocal in his insistence that analysis of the activities of workers (trade and job analysis or task analysis) was the only suitable source for industrial arts subject matter. London described Fryklund as

> a bit like Bawden. His experience with Professor Selvidge at the University of Missouri, and his work with the Army during World War II, resulted in his having an unusually stubborn conviction that he was right about things, and at times he appeared to impose his points of view on the Conference. He managed the Conference in an efficient way and kept it going along the line that Bawden had fashioned before him" (London, 1977)

Hoyt H. London (1962-1971) always has been a developer of people, and planned the programs to give multiple opportunities to new department heads for personal development. He also arranged for many conference members to earn doctorates at the University of Missouri. He must have disliked his first name, because he has always preferred to be known as H. H. London, and almost always listed Conference members by their first two initials rather than by their first name and initial. He said about himself, that his

> chief contribution, if there was one, was to keep the Conference in line with its traditions and at the same time include discussions of trade and industrial education as well as industrial arts, and to extend the benefits and influence of the Conference to all areas of the Mississippi Valley, not just the north end of it" (London, 1977).

Rupert N. Evans (1972-1980) helped to change the name of the Conference to reflect more accurately the content of its programs, to modify the "blackball" rule, and to institute procedures to prevent former department heads from blocking the membership of their successors. He involved the Conference in the study of contemporary developments, such as career education and Comprehensive Employment and Training Act programs, and encouraged attention to all of practical arts and vocational education.

Daniel L. Householder (1981-) has been less overtly directive than the previous General Chairmen, but nevertheless gets things done expeditiously. His "awards" program, which recognizes meritorious and not so meritorious contributions to the work of the Conference, is a very effective way of modifying (or at least recognizing) behavior. He continues the policy of using conference presentations as a training ground for new members, and participates in shifting the Conference direction from industrial arts to technology teacher education.

Vignettes

The Conference meets in hotels which are relatively inexpensive. This means that they are not very profitable, and are likely to be razed. The Chairman is expected to contribute to their lack of profitability by negotiating for reduced rates, free meeting rooms, and free coffee for the group, in addition to the usual concessions granted to group bookings. Among the hotels which the Conference has helped to close in the recent past are the Morrison, the Sherman and the LaSalle in Chicago and the Jefferson and the Rodeway Inn in St. Louis. Undoubtedly there were more.

A characteristic of hotels, especially the cheaper ones, is that they have a rapid turnover of personnel. The dates of the conference are checked some four years in advance and then rechecked periodically. At least half of the time, however, the hotel personnel lose the seating diagram which was agreed upon, they forget that they agreed to provide coffee, or some other difficulty arises because the sales persons have changed. This means that the Chairman must arrive early and double-check arrangements.

The Conference members always sit around a large U-shaped table, whose outside dimensions are perhaps 30 by 90 feet. Late arriving members usually sit in the inside of the U, and speakers occupy the outside of the closed end. The General Chairman usually sits at one side, near the speakers. Visitors sit in rows of chairs at the sides or facing the open end of the U. Visitors are not welcome to speak during the formal sessions, though occasionally one will be called upon by a member to provide a missing fact or idea. They make up for their temporary silence by animated discussions with members during the intermissions and in the evenings.

Each session has a chairman who is expected to see that the program participants are prepared, and another chairman who leads but does not participate in the discussion. The rules require that every presenter prepare a paper, but must not read it. The presenter is to bring enough copies for distribution at the Conference, plus copies to be mailed by the General Chairman to members who were unable to attend. The Chairman usually takes away some 10,000 sheets of paper to be mailed out when he gets home.

Fines may be levied, at the discretion of a senior member appointed for this purpose by the Chairman. The usual amount of the fine is one dollar, but egregious cases may call for a five dollar fine. The most common occasion for a fine is a member bragging about his own institution. The mere mention of the name of your own college is enough to provoke calls for a fine. Another cause for a fine is the telling of a story which is the least bit off-color. The atmosphere is such that no one would think of telling a story which is more off-color. The fines go into the purse of the General Chairman, from which the Conference expenses are paid, so when Verne Fryklund bragged about Stout State College, the calls for fines would not have had much effect. In spite of this, he never paid publicly. Almost everyone else does.

Fryklund moved from the University of Minnesota to the presidency of Stout, an institution of which he was inordinately proud. One time he was bragging about his school when he was interrupted by Homer J. Smith, the long-time head of industrial education at Minnesota. "Where is Stout?" Homer J. asked, expecting a reply that it was east of Minneapolis. Fryklund saw the trap, and explained that it was in Menomonie, in west-central Wisconsin, on the Chicago and Northwestern Railway. Homer J. inquired mildly, "Does the Zephyr 400 stop there?" (This crack aluminum train ran from Chicago, through Menomonie to Minneapolis in 400 minutes.) For once, Fryklund was speechless.

Fryklund loved to expound on the marvels of trade and job analysis, and this subject usually appeared at least once on the annual program while he was General Chairman. More recently, "technology education" and "industrial technology education" are noted frequently in Conference program titles. Meanwhile, in the colleges where most of the members work, "technology" or "industrial technology" programs with avowedly vocational goals are being offered alongside programs which prepare persons to teach in non-vocational industrial technology or technology programs in public schools. No wonder the public is confused. As the teacher education enrollments decline, and prospective industrial technology or technology teachers take more and more vocationally-oriented college classes, they may be becoming confused, also. But not the Conference members!

London believed that all graduate students (and many members of the Conference were his current or former students) needed to know much more about early members of the profession. Recognition of the pictures of these leaders was one of the things he taught. To serve as a visual aid, he had ordered letter-size half-tone prints of the people he felt to be leaders. The majority of the people he had selected were members of the Conference, or had been members at one time. He regularly offered these prints for sale. As one might expect, some prints were more popular than others. When I became Chairman, all copies had been sold of several of the prints. The remainder were placed in the Conference Archives. A feature of the departmental offices of many teacher education institutions is a display of these prints. London is the person who is responsible. Many of these prints would not have been available if he had not tracked them down.

The University Archives of the University of Illinois serve as the repository for all Conference records. These, along with those of the National Association of Industrial and Technical Teacher Educators, the Progressive Education Association, and several other organizations, are carefully cataloged and maintained in humidity- and temperature-controlled files. They are used regularly by writers and researchers.

Sometime during the Conference, not too early on Thursday and not after noon on Friday, a hat, a large envelope or some other container is passed around the table. Each member puts in a dollar or two to help with the expenses of the General Chairman. There is no account rendered, and if the Chairman suggests that he is running a bit behind, as much as three dollars may be contributed. Until Householder became Chairman, the hat was passed to visitors as well as members. This change was welcomed particularly by graduate students, most of whom have little cash.

Each visitor must be invited by a member, who is expected to introduce the guest early in the meeting. Occasionally, a member will forget who he invited, so the General Chairman makes it a practice to ask if there are visitors who have not yet been introduced. Members rarely invite more than one or two guests because large numbers of on-lookers might discourage discussion. The introduction process makes it clear who is violating this expectation. (In the Fryklund and London administrations it was almost a rule.) Graduate students prize an opportunity to visit the Conference sessions, but an invitation is absolutely necessary for an individual who hopes to become a member.

One of the oldest rules of the Conference is that there is never to be a Conference position on any policy issue. There is no chance that the Conference will express support for your point of view or any other. This rule has enabled the Conference to survive countless disagreements without schism. This is not to say that controversy is avoided. Members sometimes sound as if they are coming to blows as they state their point of view and rebut the views of others, but they rarely leave with rancor. The Conference adage is, "Take with you what you can use, and leave the rest behind."

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WHAT HAS MADE THE MISSISSIPPI VALLEY INDUSTRIAL TEACHER EDUCATION CONFERENCE EFFECTIVE?

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The Mississippi Valley Industrial Teacher Education Conference has served the profession for 79 years and appears likely to continue to do so for many decades in the future. It has been both vital and effective in serving the leadership needs of the profession over the long term, despite the fact that the founders of the organization did not envision the creation of a permanent professional association. In fact, the invitation to the first meeting stated that the conference was "not called to form a permanent organization but merely to help in the solution of problems of great importance" (Bennett, 1937, p. 503).

Since its inception, the Conference has emphasized problems of great importance to the profession. During the first 25 years of the Conference, problems considered by the group were those related to philosophy, objectives, methods, trends, and administration (Bennett, 1934). These same discussion topics have appeared in the Conference programs frequently in more recent years, as well. The dynamics of technological change have continued to focus attention upon the philosophical undergirding of the discipline, as well as its objectives, methods, trends, and administration. The recent concern for content, curriculum theory, and research appear to be natural extensions of the initial concerns of the early members of the Conference.

Bennett recorded the early history of the Conference in detail. He wrote:

> The Manual Arts Conference grew out of a letter written by Robert W. Selvidge to Charles A. Bennett of Bradley Polytechnic Institute in 1908, expressing the opinion that there was a great need of an opportunity for the teachers and organizers of manual training to get together in close conference where they might exchange views on questions of vital importance and

> express all of their heresies without being reported in educational papers. (1937, pp. 502-503)

It is interesting to speculate on the creation of the Manual Arts Conference of the Mississippi Valley. There is some indication that the Eastern Manual Training Teachers' Association, which relied on leadership and presenters from the eastern part of the United States may have, in part, contributed to the emergence of the new group. Bennett pointed out that certain consequences followed when the Manual Training Teachers' Association of America ceased to be an organization by changing its name to Eastern Manual Training Teachers' Association. "This action left the manual training teachers of the Midwest without the kind of professional organization they wanted" (Bennett, 1937, p. 550). It is also evident that a number of very able and influential educators in manual training were located in the Midwest at the turn of the century.

Charter Members

The individuals who attended the first conference at Bradley Polytechnic Institute in Peoria, Illinois, have come to be known as the charter members of the Conference. They were:

1. Lewis A. Bacon, Public Schools, Indianapolis, Indiana.
2. Charles H. Bailey, State Teachers College, now University of Northern Iowa, Cedar Falls, Iowa.
3. William T. Bawden, Illinois State Normal University, now Illinois State University, Normal, Illinois.
4. Charles A. Bennett, Bradley Polytechnic Institute, now Bradley University, Peoria, Illinois.
5. Lewis H. Burch, State Teachers College, now Western Illinois University, Macomb, Illinois.
6. George F. Buxton, The Stout Institute, now University of Wisconsin—Stout, Menomonie, Wisconsin.
7. Fred D. Crawshaw, University of Illinois, Urbana, Illinois.
8. M. L. Laubach, State Teachers College, now Indiana State University, Terre Haute, Indiana.
9. Oscar L. McMurry, Chicago Normal College, now Chicago State University, Chicago, Illinois.
10. Walter Sargent, University of Chicago, Chicago, Illinois.
11. Robert W. Selvidge, University of Missouri, Columbia, Missouri.

12. Leonard W. Wahlstrom, Francis W. Parker School, Chicago, Illinois.

This list gives an indication of who the leaders were, the institutions they represented, and the responsibilities they held. Three observations seem appropriate: (a) the state of Illinois was prominently represented; (b) the majority of the members represented institutions which were preparing manual arts teachers; and (c) several prominent authors, including Bennett, Sargent, and Selvidge, were among the group.

From the inception of the organization, emphasis was placed upon the consideration of problems of great importance to the profession. Over the years, the group considered a wide range of problems. To celebrate the 25th anniversary of its first meeting, the Manual Arts Conference of the Mississippi Valley issued its first publication, *Industrial Arts in Modern Education* (Bawden, et al., 1934). The collection of essays was published to meet the "need of an adequate statement of the present philosophy, objectives, methods, trends, and administrative problems of the industrial arts in education" (Bennett, 1934, p. 8).

Mission

The mission of the Mississippi Valley Industrial Teacher Education Conference has evolved slowly. As Evans noted:

> In 1913, two of the present-day rules of the conference were formalized: (a) the principal concern would be teacher education and (b) only one member would be chosen from any one teacher education institution. It was assumed that this member would usually be the head of a manual arts department that was responsible for training manual arts and vocational teachers and for teaching the manual arts as cultural subjects to college students. (1979, p. 414)

The Conference was founded with a pragmatic mission. Evans (1988) noted that its purpose was the exchange of information rather than policy formation. Participants discuss many issues and problems related to philosophy, objectives, methods, trends, and administration, yet each participant is free to decide upon an appropriate course of action for local programs without being subjected to officially adopted policies.

It can be seen that the Conference has retained a dynamic mission, adapting to change, embracing the expansion of programs, and changing its name to reflect its professional concerns. Many of the presentations to the Conference have found their way to published form, despite the lack of regularly published Conference proceedings.

Leadership Roles

During the first four meetings held in 1909, 1910, 1912, and 1913, Bennett acted as the chairman of a committee on arrangements, while Bawden served as secretary. At the fifth conference in 1914, the membership voted to request the U.S. Commissioner of Education, P. P. Claxton, to take over the conduct of the Conference as a function of the U. S. Bureau of Education. Claxton designated Bawden, who was specialist in industrial education at the Bureau, to represent him and to be in charge of Conference arrangements. Bawden continued in the capacity of director until he left government service in 1923. At the 14th meeting held in Urbana, Illinois, in 1923, the membership elected Bawden chairman. Subsequently, he was re-elected each year until he became known as the first life chairman.

The chairman is elected by the active members and serves as long as he continues to maintain strong interest and influence in the Conference proceedings. This characteristic of a lifetime chairman, coupled with limited membership committed to do intensive work, may have contributed in large measure to the influential professional service rendered by members of MVITEC.

The dedicated and universally respected chairmen have been: William T. Bawden, who served from 1914-1941; Verne C. Fryklund, who served from 1941-1961 (although no conferences were held 1942-1945 because of World War II); Hoyt H. London, who served from 1962-1971; Rupert N. Evans, who served from 1972-1980; and Daniel L. Householder, who has served in that capacity since 1980.

Influence of the Chairs

Evans noted that "all five of the general chairmen of the Conference have had close ties both to industrial arts and to trade and industrial education" (1988, p. 13). Earlier, he had indicated:

> It is probable that this combination of interests reflects

> the biases of the majority of the membership and, in turn, reflects the organization of industrial education programs in a high proportion of the public schools and teacher education institutions in the Mississippi Valley. (1979, p. 419)

Bawden devoted much energy to efficient organization and enthusiastic execution of presentations. He created the respect for treating the topics and discussions with intensity and dispatch. Meetings were brief and the agenda was full. These meetings were intended to serve as a forum for the exchange of ideas, but no formal position was ever intended as an outcome of any deliberation (Evans, 1979).

London noted that, as Chairman, "Fryklund was a bit like Bawden" (Evans, 1979, p. 418). The period of 47 years of service of the first two chairmen may well have established a tradition of promptness and the efficient use of time. The recollection of London as a presider was that he sometimes injected his philosophical views, particularly as they related to trade and technical education. He did enter periodically into the discussions and challenged members to exert influence in their administrative circles.

Evans expanded the range of conference topics, exerting the prerogative of the chairman to select session topics from those suggested by the membership and to add topics that seemed appropriate for the four sessions. He did a particularly good job of selecting contemporary topics, many of which were subsequently published in a wide range of journals. He often gave historic, legislative, or philosophic analysis of topics and sometimes even provided a synthesis of what was discussed at the end of a particular session.

Householder, a protege of Evans, is also sensitive to pressing and emerging topics and problems facing members in the MVITEC. Topics he has selected have had immense appeal not only to members, but also to an increasing number of visitors. There is greater evidence of matching presenters with topics of their particular interest or expertise in recent years. Similarly, there is evidence of more rigorous research efforts by the presenters.

Many traditions of promptness, dynamic delivery, heated discussions, and periodic pontificating by specific participants have been nurtured by all chairmen.

One thing they all have in common is scholarship and publications. Another is that they serve without plaques, gavels, certificates, or other overt traditional forms of recognition. Rather, their rewards come in the form of the annual presence and participation of the membership.

As the 75th Conference approaches, it is noteworthy that only five chairmen have had the formal leadership responsibilities for ensuring that the Conference provides continuous opportunity for dialogue on critical and important issues confronting the professional leaders in industrial teacher education in the Mississippi valley.

Values to the Members

Since all active members of the Conference are department chairmen or heads or hold administrative responsibility for programs in a state agency, their participation in the choice of topics, preparation and presentation of papers, and discussions allows them to contribute their insights and abilities and to interpret the implications of the Conference discussions for their local situations. The exchange of information, sharing of research and survey results, and awareness of trends also raise the participants' horizons to heighten their anticipation of future sessions.

Administrators need to withdraw periodically from their routine tasks, even if it is for only two days, to seek a fresh view of the problems, issues and changes that are impinging on their discipline. Such renewal facilitates examination of the larger problems facing the discipline, and in some cases leads to local redirection of priorities. Departmental leaders need an opportunity for renewal and growth experiences if they are to serve as effective leaders.

Visitors as Benefactors

One group of visitors is comprised of newly appointed department heads or chairs, who must attend a conference prior to their induction into the active membership. The second major group of invited visitors includes graduate students and faculty members at the institutions represented in the Conference.

The number of visitors has increased over the years. This may be due, in part, to the active members' attitude of seeing the meetings as an excellent opportunity for young professionals to interact with the leadership group in industrial teacher education.

While the visitors do not engage in discussion sessions, they have the opportunity to listen to presentations, to obtain copies of the prepared papers, to observe the discussion sessions, and to interact informally with members of the Conference. The visitors return to their local universities and share their experience with their colleagues. In effect, graduate students become attuned to the concerns discussed by the leadership in the Conference. Thus, they gain a better perspective of what issues and problems need to be researched. Every chairman since London has recognized and encouraged the presence of visitors to the Conference sessions.

Contributions to the Literature

Initially the purpose of the Conference was to exchange information; unlike many associations, the group had no intention of publishing a yearbook or conference proceedings. As the presentations became more formalized, the generally accepted practice has become to distribute papers to active and associate members and to visitors in attendance at the sessions.

Evans (1979) noted that the only publication of the Conference has been *Industrial Arts in Modern Education* (Bawden, et al., 1934). This volume was published by the Manual Arts Press in celebration of the 25th anniversary of the Manual Arts Conference of the Mississippi Valley. It has taken over fifty years before another major publication would be undertaken to celebrate the 75th anniversary of the Conference.

The induction ritual developed by G. Harold Silvius (personal communication, 1973) pointed out that many topics discussed at the Conference were edited to become manuscripts for journal publication after road-testing at MVITEC sessions. This trend continues: *The Journal of Epsilon Pi Tau*, *The Technology Teacher*, and *The Journal of Industrial Teacher Education* are among the journals which have recently published manuscripts which began as MVITEC presentations.

In his chapter on the Mississippi Valley Conference in the 28th Yearbook of the American Council on Industrial Arts Teacher Education, Evans noted that "a very high proportion of the professional books about industrial arts from 1909 until the end of World War II was written by members of the Conference" (1979, p. 421). It is likely that Conference members have written a large portion of the professional and technical books which have appeared in the field since 1945.

Despite the fact that the Conference has not published yearbooks, newsletters, or monographs, Evans captured the extent of its influence: "It will continue to be a place where excellent ideas can be discussed and transported rapidly into practice" (1979, p. 424).

Contributions to Research

At the annual meetings, presenters provide copies of their formal papers for all persons in attendance and additional copies for distribution to absent members. Frequently, members bind their MVITEC papers and make the annual volumes available to other faculty members and students in their departments. Those papers which are particularly timely and well documented serve as useful resource materials for professional and graduate courses. Some members provide their colleagues with summary reports of trends and ideas from the MVITEC sessions, either as an abstract of conference papers or as a supplement to their collection.

Research conducted by MVITEC members also provides the foundation for their presentations at other professional conferences and meetings. Members frequently return to their campuses with potential topics for further research to be explored with graduate students. While the stress on research at the Conference is perhaps not as evident as might be desirable, the impact of the Conference papers may be noted by the fact that they are more frequently referred to in theses, dissertations, and scholarly publications than was the case in the past.

Archival Collection

While Evans served as the Conference Chairman, he made arrangements in 1972 for the historical records of the Conference to be preserved in the archives of the University of Illinois Library in Urbana. The creation of a central storage location for the historical records has greatly facilitated research related to the organization and activities of the Conference. The archival collection provides a rich resource of papers on topics related to philosophy, goals, content, standards, trends, curriculum, instruction, and recruitment in the field.

Impact on Teacher Education

The MVITEC serves primarily as a conference for heads or chairs of departments of industrial teacher education. As such, it provides for a collegial exchange of ideas, problems, and concerns that are somewhat similar, despite institutional differences. There is much value in the exchange of ideas between experienced and inexperienced departmental leaders. There is also value in the critical examinations which frequently occur during the discussions, since the interaction may reveal absurdities an individual might overlook and fail to discard without the exposure to peer critique. Periodically, a young member presents a brilliant paper, raising the intellectual horizons of all who are present.

Interestingly, there are occasions when most members recognize that their problems are not unique to their institutional settings, but are shared by many others. If some new insights can be gained from the formal or informal discussions to assist in coping with the most pressing problems at the local level, this too can be beneficial.

Contributions to the Curriculum Review Process

From the very beginning, participants in the Conference discussed content as a vital topic within their profession. The nature of industrial education, with its changing technologies, materials, processes, and techniques, along with changes in the knowledge about learning and in the practices of teaching, create the need for constant attention to the curriculum review process. Curriculum theory, models, systems, and implementation are frequent topics at the MVITEC sessions. In the large number of departments with multiple majors, the curriculum questions assume an added dimension, since the appropriateness of courses and curricula must be considered for each program.

Curriculum discussions cover certification requirements, recommended program standards, levels of specialization, student teaching, divisions of programs into theory and practice courses, and credit allocations among types of courses. The surveys and reports which provide the data for the discussions also contribute to the insights attained through the curriculum review process. Of particular value in recent years have been the presentations and discussions based upon examples of curriculum development fostered within the respective states represented by the membership.

Contributions to Industrial Education in Participating States

Historically, the discussions placed much emphasis on industrial arts in the public schools, then attention shifted to teacher education, and later to graduate studies. In the early 1970s, attention was also given to trade and technical teacher education and to career education. In the 1980s, another shift included technology education.

MVITEC sessions have provided a mechanism for industrial teacher educators and state administrators to meet to share and exchange ideas. While consensus is not sought, the ideas expressed influence the participants after they return to their professional responsibilities. It is difficult to gauge the extent of the direct contributions of MVITEC to the participating states in areas of curriculum, undergraduate and graduate studies, and program quality. However, the continuing strong commitment of the membership is convincing evidence of the value of the Conference to the members in their leadership roles in the states they represent.

Exposure to New Ideas

The fact that members help to identify the topics tends to insure that the subject matter of the presentations will be of interest to them. The chairman helps to select members to present particular topics at the sessions; this also tends to ensure quality papers and presentations. The assignment to prepare and present a paper is taken seriously by the members, who typically spend several months in research and writing.

In reviewing the very early years of the Conference, Karnes (personal communication, 1977) noted that Robert W. Selvidge, who never served as Chairman, though he actually initiated the first conference, "loved nothing more than a heated discussion and lively debate" (Evans, 1979, pp. 418-419). It seems that this tradition has not lost any of its momentum. At each conference, there are those who are the critical analysts, prepared to elucidate, and sometimes pontificate, on an issue without hesitation. One can identify many personalities, including Karnes, Stern, Ray, Svendsen, Evans, Lux, Streichler, Laws, and many others, who hold strong views and enjoy spirited debate. Some of these debates span the logic spectrum from the ridiculous to the sublime, yet it is this tradition that brings vitality and humor to the sessions. Laughter, too, has a place in the lives of the members, who sometimes take themselves too seriously.

During the open discussion sessions, comments by the self-appointed critical analysts in the audience will frequently elucidate the brilliance (and sometimes the practicality) of the ideas presented. Claims of impracticality are, not surprisingly, also expressed frequently during the discussions of novel ideas and proposals.

What is perhaps most significant about the discussion sessions is the unique insistence of the group that there be no attempt to reach consensus. Rather, members are motivated to observe and participate in the processes of critical analysis, secure in the knowledge no one will be forced to accept a position, but that all are welcome to utilize those ideas which appear to have merit in their home institutions.

Sharing Experiences

Administrators of industrial teacher education programs have increasing responsibilities for curriculum development, equipment procurement, staff development, and student safety. They face many pressures attributable to advancing technology, changing needs of the clientele, and public expectations for the retention of quality programs. The fact that funding has not kept up with inflation, in most instances, has added to the complexity of administering multi-program departments.

While exchanging ideas in formal and informal sessions, members frequently discover that others are confronting similar problems. This sharing of common problems will at least increase empathy. When others discuss how they have coped with such problems as declining enrollments or retrenchment in faculty allocations, the shared information can be particularly helpful.

Can Effectiveness be Sustained?

This is not an easy question to deal with adequately. Evans (1979) observed that the Conference is unlikely to change structurally. It will continue to be a place where excellent ideas can be discussed and transported rapidly into practice.

The vitality of the Conference is enhanced by the induction of new members each year, providing a continuing source of new talent and new ideas. Evans (1979) noted that the new members are frequently well prepared and willing to assume active roles in the Conference. As members are promoted, there is a constant change in membership, yet there will continue to be opportunity for participation, interaction, sharing, and intense discussion on topics of particular interest to the group.

There is consensus among the members that the Conference has served a pragmatic and essential purpose for industrial teacher education in the Midwest, as evidenced by the fact that the Conference has persisted. The efforts to produce the 75th Conference publication and the celebration of the Conference itself is further evidence of the vitality of the organization. The Conference has been effective for those it continues to serve. It has continued to function with purposes closely aligned to those envisioned by its founders. Yet even the founders did not anticipate that the Conference would persist and serve for so many decades.

Will the effectiveness of MVITEC be maintained? After almost two decades of personal participation, it seems to me that the tradition of erudite presentations, heated debates, and informal sharing continue to characterize the sessions. At the same time, the demands on the department head or chair are increasing in magnitude, complexity, and pace. Those assuming these leadership roles will have to continue to address the academic, technical, and interpersonal problems inherent in the positions. Each generation of new departmental leaders has to find new solutions to existing and emerging problems.

Because of its relatively small size, well-defined purposes, established traditions, and ever-changing membership under the direction of a life chairman, the Mississippi Valley Industrial Teacher Education Conference will continue to assist its members to lead effectively in their professional responsibilities.

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THE CONFERENCE AND THE LITERATURE OF THE FIELD

Wesley D. Stephens
McKnight Publishing Company

The Mississippi Valley Industrial Teacher Education Conference, a meeting of peers concerned with industrial arts teacher education, has rather tightly drawn membership requirements—for eligibility and continued membership. Beyond meeting and discussing common problems, it has no similar statement of goals and objectives.

Publishers in the Conference

One of the charter members of the Manual Arts Conference of the Mississippi Valley, Charles A. Bennett, founded *Manual Training Magazine* and the Manual Arts Press (later named the Chas. A. Bennett Company, now a part of Glencoe Publishing Company). One or more persons active in publishing have been involved with the Conference throughout its existence. It seems probable that this connection was not a deliberate effort to influence the literature. Rather, it grew out of the desire to include in the Conference deliberations the input of those with knowledge and experience in publishing, even though they were not active participants in industrial teacher education.

James McKinney, of the American Technical Society, became a member in 1919, then John J. Metz of *Industrial Education Magazine* in 1927. Soon after establishing *School Shop* magazine, Lawrence W. Prakken became a member in 1948. After the Active-at-Large membership classification was established by the Conference at the 1972 Business Meeting, Wesley D. Stephens of McKnight Publishing Company was elected to Active-at-Large status in 1973. Stephens had been a regular guest since 1948. At first, he was invited as a guest by G. Harold Silvius of Wayne State University. Later, a standing invitation was issued by Chairman Verne C. Fryklund. This courtesy was continued by H. H. London and Rupert N. Evans during their tenures in office.

Several individuals who qualified for Active Membership in the Conference because they met the standard criteria subsequently assumed consulting roles or full-time positions with publishers. Louis V. Newkirk (1927), Chicago Public Schools, coordinated a series of books for the Macmillan Company. DeWitt Hunt (1927), Oklahoma State University, edited *The Industrial Arts Teacher* for many years. Tom Diamond (1934), contributed a column (and wise counsel) to *School Shop* magazine after retiring from the University of Michigan. Chris H. Groneman (1940), Texas A&M University, served as coordinating editor for McGraw-Hill Book Company for a number of years. Stanley J. Pawelek (1940), St. Cloud State University, was affiliated with D. C. Heath. John L. Feirer (1948), Western Michigan University, edited *Industrial Education* magazine for several years and is professionally active at this writing.

Publisher Activity in Other Organizations

Many national and area sales representatives of publishing firms are also dues-paying members of state and regional education associations. Their participation in the programs at the association meetings is usually in the form of new product or new process demonstrations. In such cases, professional association membership may be viewed primarily as a financial contribution to the association, in addition to exhibit booth rental at conventions. Associations frequently solicit input about meeting locations and local arrangements from publishers and other educational vendors.

There is an official liaison relationship between the Educational Exhibitors Association (SHIP) and both the American Vocational Association and the International Technology Education Association. Again, this relationship is primarily concerned with meeting locations, facilities, and exhibit arrangements—and the items at issue are of paramount concern to machinery and supply companies.

As companies, three publishing firms have long-standing relationships with projects of national associations. McKnight Publishing Company (now Glencoe) produces and distributes the yearbook series for the Council on Technology Teacher Education. American Technical Society underwrites and produces the *Journal of Industrial Teacher Education* for the National Association of Industrial and Technical Teacher Educators. Goodheart-Willcox underwrites the *Industrial Teacher Education*

Directory, a jointly-sponsored project of the National Association of Industrial and Technical Teacher Educators and the Council on Technology Teacher Education.

Publishers and other educational suppliers have a long record of financial participation in activities of professional associations. Industrial arts awards programs conducted at national, regional and state levels are notable examples. Mass production competitions, craftsmanship awards, and master teacher recognition programs are supported in whole or in part by publishers and other commercial concerns. More recently, scholarships and convention programs have been underwritten, with varying degrees of participation in addition to financial support.

Conference Members and the Literature

In his paper, W. D. Wolansky refers to the value of the Conference in road-testing topics for magazine articles and theses for publications. He also makes reference to the substantial body of professional materials and technical texts and references produced by Conference members. A somewhat-more-than-offhand analysis of the cumulative Conference membership, 374 persons, produced a tally of 63 individuals who have produced texts or edited yearbooks—with no attempt to identify individuals whose authorship has been restricted to magazine articles or monographs. This incidence of participation, approximately 17%, holds true when the present group of Active and Associate Members are tallied and compared with Former Active Members.

Benefits of Conference Participation

The unique Conference format schedules 45 minutes of presentations followed by 75 minutes of question, discussion and disagreement for each half-day session. At meetings of other groups, it is more usual to see 45 minutes of presentation followed by 5-10 minutes of questions.

Publisher Benefits

The evaluation of ideas, schools, and people is an uncertain but important function in the administration and management of a publishing enterprise. It is typically performed by an individual or, at most, two or three persons. What to publish, who can prepare it, what are the trends in subject enrollments, what are alternative approaches—these may not be quantifiable. This is particularly true of an emerging subject or organizational structure.

When the Mississippi Valley Industrial Teacher Education Conference is concerned with such topics as the organization of subject matter, emerging content of industrial arts, or the structure of technology education, the chairman typically selects presenters to give two or more sides of the picture. Then 50 of the best minds in the profession react—at least 10 of them quickly during the oral interaction, and some of them critically. Observing this interplay provides insights into philosophies, people and organizational possibilities. All these provide the publisher with opportunities which are unavailable "in house" within the publishing organization. Enrollment data and statistics can show markets, but cannot show approaches. An editor one-on-one with a hopeful author or multiple authors benefits from previous opportunities to listen to and participate in considerations of curriculum content and organization.

The benefits of such a background for an editor are probably less now than they were a decade or two decades ago. Since the completion of major funded curriculum research efforts, and the more general dissemination of the findings of research in methods of educational change, there has been a shift in the responsibility for bringing about curriculum evolution in the field. State educational agencies, regional accreditation groups and national professional organizations have taken leadership roles to bring about changes in content and method. During the same time, costs of book production and distribution have increased dramatically. Texts are now pointed toward courses with substantial minimum enrollments at the national level and planned around published courses of study along with a careful analysis of competitive titles. The opportunity to develop a pioneering effort is not available in the way it was 20 years ago when individual efforts in power, industrial plastics, introduction to commercial architecture, and industrial sketching could be published with the expectation of profitable market acceptance. Professional books have become increasingly unavailable as lowered enrollments, smaller potential markets, and higher publishing costs resulted in an unacceptable profitability equation.

With the advent of desk-top publishing, this gloomy picture should change. Electronic reproduction processes and widespread adoption of high-speed color copiers may make the traditional publisher's inventory obsolete. Instead of just-in-time manufacturing to minimize inventory costs, books might be manufactured after-order to eliminate overhead attributable to inventory.

Benefits to the Profession

A substantial number of representatives of publishing houses have attended our annual Conferences as guests over the years. These names come quickly to mind: Harry Sears, Dave McCarl, Rahy Paul, and Tommy Proctor of American Technical Society; Charlie Roper and Bill McKnight of McKnight Publishing; Floyd Mix, George Fisher, and John Flanagan of Goodheart-Willcox; Richard Simpson and Mike Kenney of Chas. A. Bennett; and Henry Thomassen, then of McGraw-Hill. A study of the guest lists would undoubtedly provide many more names familiar to Conference members. The declining number of such people may mean that there is less commitment to the general field of industrial arts/technology education by publishers than was formerly the case. New product proposals depend on numbers of enrollments, there is little knowledge of trends and developing materials, and the company commitment is to the best and surest return. On occasion, Conference members have brought campus administrative persons as guests, thinking that the observation of the Conference sessions would be a worthwhile professional experience for them. This same benefit may not have been intended when publishers attended, but in one way or another the feeling of commitment did develop.

As an industry, publishing has been affected by the merger mania of recent years. Smaller, often family-held, companies have been acquired by larger companies which are often divisions of publishing/information/communication giants. Consequently, promotional paths for individuals are now more often across divisions than within a single department or company. One outcome of this trend may be reduced commitment of representatives of the publishing industry to the concerns of the Conference.

But the turnover in publishing is matched, or perhaps exceeded, by the turnover in the leadership of teacher education programs in the multiple-emphasis university departments of industrial studies which have become common. A succession of extremely gifted Conference members from each of several institutions could be cited. They move in and then up or out. While industrial teacher education may continue to be a part of their larger responsibilities, it is frequently difficult for them to continue to make valuable contributions to the field. Moreover, the changing nature of the Conference membership and the frequent turnover in leadership positions inhibits the development of the deep friendships and intimate knowledge of one another that marked the professional exchanges between such individuals as Ray Larsen, Bud Micheels, and Ray Karnes. No matter what the program topics might be, at some point during the Conference, there would be an eruption, a fiery exchange, and then a friendly beer over lunch at the Berghoff. In more recent times, Don Lux, Fred Kagy, Don Lauda, and Tommy Tomlinson have been known to square off in similar interchanges. The point is—there was sufficient time to permit the development of in-depth knowledge of one another which facilitated heated, loud and perhaps even abusive discussion without personal offense. It is different when one's opponent is little more than an acquaintance. (Editors and authors have been known to have heated exchanges, too.)

The Conference, or its individual members, may not be able to develop relationships with publishers to help bring about the deeper knowledge and familiarity with the field and its people that will induce a feeling of commitment. There is a rapid turnover on both sides. And it is not a primary objective of the Conference; rather, it is a fringe benefit which, unfortunately, may no longer be available.

Truly Personal Recollections

There is no way to be positive that 1948 was my first attendance as a guest at the Mississippi Valley Conference. It was in the Morrison Hotel—one of several past meeting sites to have been demolished—and as a guest of G. Harold Silvius, though I remember discussing business with Chairman Fryklund having to do with the revision of one of his texts. I believe my attendance has been continuous since that time, although I may have missed the next year.

Chairmen

Fryklund could be counted on for several things during each annual conference. There would be more than one reference to The Stout Institute as the nonpareil teacher preparation place. At least one fine would be levied on a member for having referred to his institution by name. That also called for a reference to Stout, but I don't recall any money paid out by Fryklund. And always, *Trade and Job Analysis* would be mentioned.

London could be counted on for the last word, typically as he resumed the chair at the end of a session. He joined discussions more often than Fryklund, and maintained the professor/advisor-student role with many of the Conference members. Members frequently paid their story-telling fines before relating their stories. Dues were kept lower.

Evans cleaned up the structure—the name, the membership rules, the archives, the program construction. The Dean would sit patiently through a discussion—as he still does—stoke his pipe, write one or two words on his program, then straighten up, run his hand through his hair and be ready to take his turn at bat—usually hitting clean-up.

Householder is the giver of awards—laudatory, sardonic, humorous—and well-earned. Best story, most unreadable visuals, longest overrun on time allocation, most changes of coats, best unscheduled paper presented without pass-out copies—this feature of the last program session wind-up is worth staying to hear. Dan holds the record for fastest paperwork turnaround of all chairmen.

Perennial Questioner-Presenters

There is a widely applicable generalization known as the 80-20 rule. Twenty percent of the customers produce 80% of the sales; 80% of the discipline problems come from 20% of the students; 20% of the items in a product line account for 80% of the sales. The rule appears to hold true in the Conference, where 20% of the members seem to use 80% of the question period.

The champion—retired undefeated—Harold Silvius appeared more times, used more minutes, and endured more groans than anyone before or since. His contemporaries probably never hear or read "cutting edge," "road-tested," or "one of America's great cities" without thinking of Harold. He was sometimes observed to lay his watch down so he wouldn't run over time while asking a question, though questions presumably had no time limit! There are those who would say that Norm Laws aspires to the title so long defended by Silvius.

Earlier reference was made to the exchanges among Ray Larsen, Bud Micheels and Ray Karnes and those among Don Lux, Fred Kagy, Don Lauda, and Tommy Tomlinson. Jerry Streichler and Willis Ray could make that a sixsome, but that is too many to play any course.

Here is my roll call of the 20% who have dominated the question sessions—with notations to assist readers who may not be able to make their own characterizations from memory:

Joseph J. Carrel - Insightful, often sarcastic, enthusiastic.

C. Dale Lemons - Our most traveled member.

H. James Rokusek - Careful preparations, delivered beautifully.

David C. Bjorkquist - Always polished and lucid questions and presentations.

Myron Bender - Transportation specialist.

E. Keith Blankenbaker - Voice alone commands attention.

Terry J. Squier - Detailed, scholarly attention to problems.

G. Eugene Martin - Intense, organized achiever.

L. Dayle Yeager - Intense, hasn't really relaxed with us, yet.

Leonard F. Sterry - Communications is his bag in many ways.

William E. Dugger, Jr. - "What does the research say?"

James E. Good - "Here's the way we do it in New York."

Everett N. Israel - What happens to all those notes?

Ernest N. Savage - Impressive in presentations, understands structure of the field.

F. Victor Sullivan - Quiet, but often on his feet; practical.

William D. Wolansky - Questioner or presenter: always insightful.

Dewey F. Barich - Emotional, challenging, "let's do it!"

M. James Bensen - Always in command, but too many job changes.

Edward M. Claude - Quiet, almost retiring - penetrating.

Jack A. Fuzak - Didn't stay with us long enough.

Ralph O. Gallington - Quiet, but picked people superbly.

Nelson Grote - Moved through the Conference too quickly.

DeWitt Hunt - His work was his hobby, too.

Franklin J. King - Thoughtful summarizer.

Walter A. Klehm - Had to be upset about something.

Hugh L. Oakley - Southern gentleman; couldn't feel his skinning knife.

Delmar W. Olson - Characteristically, defending his views.

Charles B. Porter - Early computer buff; it influenced every comment.

Lawrence W. Prakken - Listened intently; always covered the Conference.

Howard O. Reed - "But will it work?"

Dempsey E. Reid - "Don't forget—life is fun!"

Asbury Smith - "I'm just a country boy." (But watch out!)

Henry J. Sredl - The asides are better than the alouds.

Fred Strickler - Dropped ideas like beads of sweat.

Lewis W. Yoho - "The players practice before participating in the game."

Clyde A. Bowman - Are all deans deliberate, or quickly learn to be so?

B. Eugene Brightwell - Always remembered he was a supervisor.

S. M. Dell - Took a lot of provocation, but he often fired up.

Thomas Diamond - Another pipe-smoking philosopher.

Everett R. Glazener - Photographed the leaders; fabulous collection.

Thomas A. Hippaka - Always had to have the same seat—at the end.

John A. Jarvis - "At Stout, we do it this way."

Arthur B. Mays - A gentleman of the old school.

Howard F. Nelson - Hard to get wound up, but tenacious then.

Fred J. Schmidt, Jr. - Summarizer, questioner, gentleman.

Homer J. Smith - An intense liking for people.

Ethan A. T. Svendsen - Convoluted reasoning, but he knew the trail.

R. M. Torgerson - Stricken during a session, after participating.

Sylvan A. Yager - The old red-head could fire hard ones.

Disposition of Papers

When one returns from an annual Conference with one-half ream of copier paper (formerly mimeograph paper), what happens? Wolansky referred to binding and circulating the papers, then shelving them in the departmental collection. Other members have filed their papers by subject.

With a publisher's focus on content, structure, and sequence, my files are slim. They are further shortened by space limitations and my impressions of currentness. What one has-been keeps is not indicative of values that other publishers would have, but an inventory of my current collection might offer insight to Conference members as they individually consider benefits that might accrue to publishers and to the profession from participation in the Mississippi Valley Industrial Teacher Education Conference.

The listing of my current collection of papers follows:

1981

William J. Lacroix, *What are the possible scenarios for the future of industrial arts ten to twenty years ahead? What programs, courses, or emphasis areas should be included in the ideal industrial arts program?*

M. James Bensen, *What was the scope of the Jackson's Mill curriculum symposium, and what are its implications?*

Myron Bender, *What is the content of technology and how does it differ from traditional industrial arts education?*

1982

Rupert N. Evans, *Gross estimates: Size of major national occupational training systems, range of quality, and approximate Federal costs and degree of Federal control.*

James E. Good, *What subject matter/curriculum changes are evident in City and State courses of study since the completion of the American Industry Project, publication of IACP materials, and publication of the Maryland Plan?*

Leonard F. Sterry, *Implementation of curriculum change.*

Donald P. Lauda, *Three scenarios on the technology education base.*

1983

D. Thomas Ryerson, *What are the implications of the proposed education schemes which exclude industrial arts in favor of expanded general education opportunities? Do other proposals call for industrial arts of a very general nature? How does industrial arts cope with the "back-to-basics" movement?*

Clyde O. Craft, *Computers in industrial arts teacher education.*

Alvin E. Rudisill, *How should we implement and finance high technology programs?*

John T. Fecik, *What implication does high technology have for industrial education curriculum development? If we add it to the curriculum, what will we take out?*

1985

James E. Good, *What are the features (including content organizers) of the New York plan? How is it being implemented? What are the major steps in the change process? How have undergraduate programs and federal/state funding been affected?*

Ernest N. Savage, *Assume you have been asked to provide prospective teachers with the essential attitudes, knowledges, and skills needed to teach industrial technology education (communications, construction, manufacturing, and power/energy and transportation). How would you organize the laboratory portion of the program?*

Terry J. Squier, *What specific competencies should technology education develop in today's students in grades 7-12 to help them prepare for life and work in their future? What experiences will need to be provided to students in grades 7-12 in the year 2001?*

1986

E. Keith Blankenbaker, *Public perceptions regarding technology education: What are the perceptions of the public about who is teaching technology in the public schools? Where does industrial arts/technology education fit in? What are the implications of the Principles of Technology program for industrial education in the secondary schools?*

Ronald E. Jones, *Technology education and technological literacy.*

William J. Lacroix, *What are the characteristics (excluding technical skills) required for successful professional performance as an industrial arts/technology education teacher? Can these* *characteristics be taught or developed during the teacher education program? Should they be criteria for the selection of teacher education students?*

Leonard F. Sterry, *A relationship between technology education and trade and industrial education.*

1987

Rodney E. Frey, *Is there a philosophy of technology? Are there different approaches to the philosophy of technology? Is there a framework for critiquing a philosophy of technology? Is philosophy of technology different from philosophy of science?*

James G. McMurry, *The impact of recent teacher education reform movements such as the Carnegie report and the Holmes Group report on teacher education programs in industrial education.*

Joseph J. Carrel, *What competencies qualify a person as being "technologically literate?" How can we educate people to be technically literate in a society where technology changes so fast?*

Lowell D. Anderson, *A comparison of the development of technology education curriculum to curriculum development in selected disciplines during the past twenty-five years.*

Conclusion

The regularity of my attendance is testimony to the value I have placed on the Conference and my participation in it. Membership has been an honor that I cherish most deeply.

TECHNOLOGY EDUCATION: THE CULMINATION OF A SEVENTY-NINE YEAR QUEST

C. Dale Lemons
Pittsburg State University

The Manual Arts Conference of the Mississippi Valley met for the first time in 1909. Since that time, the group has had several names, including Mississippi Valley Manual Arts Conference, Mississippi Valley Industrial Arts Conference, and Mississippi Valley Industrial Teacher Education Conference. In an attempt to reduce reader confusion, I have chosen to refer to the group as the Mississippi Valley Conference (MVC) in this paper, and to use that designation or the term, Conference, to identify it at all times during its development.

Throughout its history, MVC has provided a forum for the discussion of problems related to teacher education in the manual arts, industrial arts, and technological subjects. Bawden (1929) wrote that, at the time of its origin, the Conference

> consisted of a group of men invited by Bradley Institute, and selected with the sole thought of bringing together a small group of men, from the nearby territory, known to be interested in the special problems of the preparation of teachers of manual arts and industrial subjects. (p. 2)

Although its territory now includes twenty states, and the "special problems" have expanded over time to include all manner of topics and professional fads related to areas of administrative concern to the members; contemporary debates about the preparation of teachers have remained central in the annual meetings.

There have been, at times, disagreements about the degree of leadership provided by the Conference to the profession, but the professional leadership provided by individual members of the Conference is not questioned. The policies and structure of the organization, however, tend to relegate it to the position of follower. The MVC, as an organization, does not promote a position or crusade for a cause. Many individual members, however, are at the forefront in advancing the profession. Others, obviously, are defenders of established positions. It is because of this reflective character of the Conference that I proposed and conducted the research which resulted in this paper. As presentations and debates in meetings of the Conference reveal concerns of the membership at any selected time in its history, a review and analysis of all the topics which have been presented can disclose overall trends of the disciplines represented in the Conference.

The Problem

This study was undertaken to test the premise that technology education is the outcome which the field most recently known as industrial arts has been seeking since its beginning. The study is limited to the Mississippi Valley Conference, with the assumption that its debates reflect the concerns of the discipline. In other words, it is hypothesized that technology education is the culmination of a 79-year quest for content direction and instructional purpose in the Mississippi Valley Conference.

The Procedures

Professional leaders associated with the Mississippi Valley Conference have influenced program directions taken by the field. Within the conference sessions, they have discussed virtually every conceivable theory and fad which has been operative in the profession over the years. Therefore, it is possible to deduce directions and trends within the profession by studying the frequency of conference presentations on specific topics, and by reviewing the content of those presentations. This study utilized two research methodologies; one quasi-objective and the other interpretive. Together, the methods identify discernable patterns which depict directions in the field.

Quasi-Objective Method

Lacking both the time and will to undertake a sophisticated research endeavor involving jury evaluations and classification of the papers presented throughout the years, the author used a quasi-objective approach. The Conference archives available in the Library of the University of Illinois were reviewed to identify the topics and subtopics discussed at the conferences. Titles, subtitles, dates, and names of presenters were entered into a Lotus 1-2-3 database. Each of these was assigned a single topic classification and a subject matter code. These are described below.

Topic classifications were based on an interpretation of the title and/or subtitles and, when available, the outline or paper itself. The classifications were not predetermined, but resulted from examination of the topics. Those used are: administration, certification, conference, content, curriculum, evaluation, facilities, graduate, guidance, methods, philosophy, research, status, student, standards, teacher education, and vocational education. It was possible to assign one of these classifications to each presentation. The single classification approach makes for a weakness in the method as most topics significantly relate to more than one classification, for example, curriculum and teacher education.

A subject matter code was also assigned to each title or subtitle. As with the topic classifications, the number of descriptions was not predetermined, but descriptors were identified from the review of the presentations. The codes and descriptions are: CE, career education; IA, industrial arts; IE, industrial education (including topics related both to industrial arts and to trade and industrial education); IT, industrial technology; MA, manual arts; MT, manual training; NA, not applicable; TE, technology education; and TI, trade and industrial.

Interpretive Method

The interpretive method is less complicated. It simply involves reading the papers and studying the titles to extract an essence of each of the three periods, representing the early, middle and recent eras of the Conference. An in-depth review of papers and discussions was virtually impossible, so papers were selected which appeared to be typical of the conferences for the period of time being considered and which had titles dealing with the content, philosophy, and/or directions of the field. Any presentation with a title which appeared to be related was scanned. Those relevant to the thesis were studied and reported appropriately. The MVC histories which had been written and reported by others provided additional valuable interpretation and viewpoints (Bawden, 1929; Whalin, Klehm, & Silvius, 1971).

Periods of the Conference

For the purposes of this study, three time periods were arbitrarily designated. The first, the early period, includes 1909 through 1941. The second, the middle period, covers 1942 through 1970; there were no conferences in 1942-1945. The last, the recent period, begins with 1971 and includes 1987. Thus, the early period includes a span of 33 years encompassing 26 conferences from which papers were available for examination. The middle years cover 29 years during which 24 conferences were held. The recent period includes 17 years and papers from those 17 conferences.

Debates in the Mississippi Valley Conference

From the first presentation, "Our unscientific attitude," by Selvidge in 1909, more than 538 topics have been presented and discussed in annual meetings of the group known as the Mississippi Valley Conference. This total includes 9 titles from regional conferences held in the Mississippi Valley area during 1922. These conferences were for supervisors, specialists, principals, and teachers to discuss topics selected by Bawden, then Assistant to the Commissioner, U. S. Bureau of Education. The exact number of presentations is difficult to establish, since the archives do not contain complete records of the early meetings. Documentation exists to indicate that meetings were held every year except 1911 and 1942 through 1945; there was no meeting in 1922, but two were held in 1923. Programs are missing from the archives for 12 of the 74 conferences; however, written histories of the Conference verify that presentations were made in at least six of those conferences. The programs on file in the archives include 529 identifiable titles, including presentations, panel discussions, and subtopics within thematic sessions. With the exception of the earliest years of the Conference when the chairman chose the theme of each meeting, the topics have reflected the results of a referendum of the membership. The papers, then, were directed toward topics of current interest and concern to members in the Conference and thus the tabulation of topics may serve as a barometer of change in the field.

Of the 529 topics, 200 were identified with the subject title of industrial arts and 162 with industrial education. Of these, 132 were philosophical, 89 were teacher education oriented, 61 were concerned with content, and 58 dealt with administration.

Examination of Table 1 reveals some interesting combinations between topic classifications and subject matter.

Table 1

Mississippi Valley Conferences, 1909-1987
Number of Presentations by Topic Classification and Subject Matter Code

		Subject Matter Code								
Classification	Total	CE	IA	IE	IT	MA	MT	NA	TE	TI
Totals	538	10	200	162	10	85	7	9	44	11
Administration	58	0	17	29	2	3	1	2	3	1
Certification	8	0	2	3	0	3	0	0	0	0
Conference	20	0	6	11	0	3	0	0	0	0
Content	61	0	25	12	3	8	2	0	10	1
Curriculum	24	0	10	4	0	4	0	0	5	1
Evaluation	22	0	2	10	0	6	0	1	2	1
Facilities	8	0	1	4	0	3	0	0	0	0
Graduate	23	0	10	12	1	0	0	0	0	0
Guidance	1	0	0	0	0	0	0	0	0	1
Methods	36	0	16	7	0	9	1	0	1	2
Philosophy	132	10	59	31	1	10	1	2	18	0
Research	23	0	12	2	0	9	0	0	0	0
Status	15	0	8	4	1	2	0	0	0	0
Students	5	0	0	1	0	0	0	4	0	0
Standards	8	0	6	0	0	2	0	0	0	0
Teacher Education	89	0	26	32	2	23	0	0	5	1
Vocational Education	5	0	0	0	0	0	2	0	0	3

(Legend continued next page)

Legend - Subject Matter Codes:

CE	Career Education
IA	Industrial Arts
IE	Industrial Education
IT	Industrial Technology
MA	Manual Arts
MT	Manual Training
NA	Not Applicable
TE	Technology Education
TI	Trade and Industrial Education

The predominant topic classification in manual arts was that of teacher education with philosophy a distant second. In industrial arts, the chief topics were in the classifications of philosophy, 29.5%, with teacher education, 13%, and content, 12.5%, almost tied for second and third places. Industrial education did not have a clearly predominating topic classification, with teacher education, 19.8%, philosophy, 19.1%, and administration, 17.9%, heading a uniformly distributed list. Technology education had 41% of its topics presented in philosophy and another 22.7% in content.

These data are interesting, though not too surprising upon reflection. Manual arts was the subject title most used at the beginning of the MVC and was in common use at a time when few programs of teacher education were firmly established. The most pressing problems for MVC members were those relating directly to teacher education. Many of the topics listed as philosophy were concerned with the philosophies underlying teacher education. Industrial education has persisted as a term longer than any other, but it has always been viewed in a generic sense; thus, the topics presented have been generic also. While the titles are not specific, much of the content of the discussion under the generic term, industrial education, was actually centered upon industrial arts.

The Early Period

The early period was established to include 1909 through 1941. There appeared to be no logical break in the continuity of MVC discussions before 1941. The Conference sessions were suspended during the war years, 1942-45, providing a chronological break useful for the present analysis. Within the early period, there were observable shifts, both in topic classifications and in subject matter. During the first twenty years of the period, more programs focused on teacher education and methods whereas in the later years the focus shifted to philosophy. These changes parallel the shifts in subject matter from manual arts to industrial arts. There were 65 titles relating to manual arts prior to 1930 and 18 in the remainder of the period. Only seven topics dealt with industrial arts during the first part of the period, but there were 55 industrial arts topics in the later years—a complete reversal of content emphasis. The earliest mention of industrial arts in program titles was in 1918 in a presentation by Bawden (1918). The next was as a subtopic in 1927 (Whitcomb, 1927). However, Roberts (1923), in a report on manual arts, included

> industrial arts in the junior high school: (a) functions of the industrial arts; (b) determining the objectives; (c) methods; and (d) basis for determining subject matter; (e) courses of study—(i) mechanical drawing; (ii) simple mechanics; (iii) woodwork; (iv) general metal work; and (v) printing. (pp. 32-33)

It appears that the use of the term "industrial arts" was avoided in the printed material. Perhaps since the term, manual arts, appeared in the Conference title, the members or the Chairman felt that the programs should use that term in their titles also.

In his summary of the 1923 Conference, Bennett (1923) observed the need for societal relevance by stating:

> The manual-arts teacher must have broad preparation, unusual personal qualifications, and especially genuine ability as a social leader, if he is to meet present-day demands. It has been shown that he must become a real factor in the life of the school, and in the community in which he works.
>
> This is a large program, and an inspiring one. Just as rapidly as we make our work a vital part of the educational program as a whole, and in a big way we shall surely gain recognition. (p. 35)

Bennett also commented on the general shop:

> We have discussed here the general shop, and made it the focal point for a very profitable discussion of methods. In the general shop it is proposed to have a number of more or less distinct lines of work in progress at the same time. . . .
>
> Some have suggested that work of this type be substituted outright for the single-track bench woodworking shop of the usual small high school, but our discussion shows two points of view. Someone said that the general shop is, at its best, a scheme for relieving the teacher of the necessity of organized class instruction, and, at its worst, a chaos of confusion which we should not tolerate. (p.35)

Obviously, change was as difficult in those days as it is today. Although Bennett was commenting on the programs of the era and seemingly defending the more traditional approach, it is evident that the changing society and educational scene was impacting the infant programs of manual arts.

In his paper on the programs of the Conference in the first twenty years, Bawden (1929) made no mention of industrial arts. He did list the topics which had been presented by various classifications—many similar to those used in this report. His review, as well as the author's observations, revealed little in the way of new directions. He stated:

> A study of these major groups of topics reveals not only a remarkable breadth of interest, keenness and depth of penetration, earnestness and intensity of application, but withal a singularly successful concentration thru a period of 20 constructive years upon the essentials of a clearly-defined problem—the preparation of teachers of manual arts and industrial subjects. (1929, p. 14)

There were troubled times on both national and international scenes during this period. Industrialization was accelerated by World War I and the emphasis on vocational education, spurred on by the war effort, affected educational philosophy. The differences between general education and vocational education purposes affected the content of MVC presentations and the content of school curriculums. Industrial arts had become the predominant subject title but controversy existed about content, methods, and organization of the field. Discussions about the general shop began in 1923 and were still raging in 1930 (Myers, 1930). It is interesting to note that while the term industrial arts did not appear in the MVC program in 1930, in 1931 the term was included in two topic titles, and in 1932 it dominated the Conference.

It was recognized that industrial arts would perform a greater role in education than in the development of manipulative skill and project making. In his summary of the discussion of the 23rd Manual Arts Conference, Bennett observed:

> Without any apparent effort to do so, this conference has emphasized our deficiencies. We go home more humble than we came. . . . We must prove to school superintendents, to school principals, and to professors of education that our vision is not limited to technical and vocational values, and by our statements and our acts we must demonstrate that we see for our special subject an increasingly necessary place in general education—in an education which aims to prepare every boy and girl to meet the problems of adequate living.
>
> The question would then arise: What shall be included in this new subject-matter? Shall the course become stronger in the direction of science?, of art?, of engineering?, of economics?, or of all four of these? (1932, pp. 39-40)

Not only had industrial arts arrived at this time; appreciation for the objective of meeting societal needs was quickly accepted by at least some of the members. Changes which the industrial era had brought to society and the need to prepare youth for functional living in that society had become an objective of the field. Friese (1933) acknowledged the changing industrial society and the educational challenges posed to the profession:

> Industrial arts is a varying and selected group of hand craft and industrial machine experiences in general education offered in such a manner as to contribute to the needed industrial intelligence of all boys (and girls

> in some instances) in harmony with the new, complex, and rapidly changing social, economic and industrial world. (p. 1)

The demands of a changing social order were well presented by Newell (1934) as he pointed out relationships of science, economics, and politics to industrial pursuits. At the same meeting, Crowley (1934), commented on invention and technological improvement as charges to be met in the future of industrial arts. Clearly, there was a growing feeling that manual arts and industrial arts were more than shopwork. Some men of vision were seeing beyond the bounds of industrial arts (which itself was struggling for definition at the time) to something beyond industry as a base. Swope (1935) presented a challenging paper in the 26th MVC in which change was the principal focus. He said:

> There is no doubt that the implication carried in the name of industrial arts itself indicates to the average man that it has in some way some connection with industry. . . . Industrial arts in general took its name from the substance or the materials which were first taught in the course. There is some evidence that we are about to change that substance and still retain the name. (p. 3)

For the future, Swope had visions of a society beyond the industrial era in which industrial arts was born. He proposed:

> The writer believes that it is a mistake to point out constantly to children that this is an industrial age with the consequent implication that the most important thing in the next generation will be industrial life. It is conceivable that we may as a nation depart on some other avenue of adventure than the application of scientific principles which were formulated two or three generations ago to industrial life primarily. We are still living in an age of science in which industry is only an important incident. It is quite true that from the social standpoint we have a long way to go in the development of an industrial life which shall be satisfactory. The fact should not be overlooked, however, that our training in school might be the means of adapting the child to see beyond these horizons. (p. 4)

Swope had no way of anticipating the technological advancements which have transpired. He did anticipate correctly that the future would encompass much more than industry as it was known at the time.

Debates about objectives of industrial arts began in this period and continued for many years afterward. Discussions about content and methods, both for the public schools and teacher education, were prevalent through the remainder of the period. Throughout all of the early years, a great amount of attention was given to graduate programs as well as to undergraduate teacher education. The profession did not seem to be especially interested in exploring where the field should be going to prepare students for the future. Though the Conference busied itself with the day-to-day problems of teaching and administration, it was apparent that at least some of the leaders were concerned with a larger picture.

The Middle Period

The middle period covers the years 1946 through 1970, beginning with the first meeting after World War II, and ending in 1970 at a time of change in direction of the Conference and the profession.

During this period, 126 topics were presented, 23% of the total during the 74 conferences. Presentations were distributed uniformly among the classifications, with no single classification dominating the period. There were 30 (24%) titles classified as philosophy, 16 (13%) as teacher education, 15 (12%) in content, and 14 (11%) in graduate. Although philosophy accounted for 24% of the presentations within the period, this was only 23% of the total philosophy presentations made in all periods. Within the period, 76% of the topics dealt with industrial arts and another 20% concerned industrial education. Looked at another way, 48% of the topics coded as industrial arts were presented in this period. Industrial technology was barely introduced with 3 presentations. Although the numbers were small (23 presentations in the 75 year span), 61% of the topics classified as graduate were presented in this middle period. As in the early period, statistics do not tell clearly what happened.

The MVC picked up after the war with a bland menu of topics. (Some historians have stated that the Mississippi Valley Conference changed its name in 1941; however, the program bulletins continued to carry the name of Mississippi Valley Manual Arts Conference until 1948.) The 1946 Manual Arts Conference was concerned with recruitment and training of industrial arts teachers, the use of war surplus materials, and teaching materials. The next year, graduate studies, supervision, and reviews of research were the topics. In 1948, however, a new thrust appeared: the purpose and direction of industrial arts in general education.

Schmidt (1948) provided insight into the future of the profession linking the industrial and technical with the social and political for meeting the needs of individual students. The list of some 60 aims and objectives he suggested for discussion included these:

> A more complete recognition of the worth of the individual and his needs.
>
> A social and recreational program which will help individuals to fit themselves more successfully into groups. Training for citizenship.
>
> The function of general education is not to develop the learned man or the professional technician but to provide the basis for intelligent living regardless of the type of life the individual may chance to have or the circumstances that surround it. (pp. 1-2)

Technology from World War II had an impact upon the language of MVC, if not upon industrial arts programs. Feirer (1949) presented a forward-looking paper on the "air age". He asked, "Is the Air Age of greater or lesser significance to the industrial arts program than the following: (a) the atomic age; (b) the age of sight and sound; or (c) the age of synthetic materials?" (p. 1)

Unfortunately, misinterpretation of purpose prevailed even then. Feirer reported this statement from the industrial arts teacher in a school which had established an air age center: "One of the activities the department participated in was building, repairing and refinishing furniture used in the air age center" (1949, p. 2). It is unfortunate that industrial arts students were only tangentially associated with air age activities.

In the span of seven conferences, 1947 through 1953, at least one presentation on graduate study was made in each meeting. Equally prevalent were discussions justifying industrial arts in the educational system. This was a period of searching for meaning in industrial arts. Frequent references were made to the objectives of industrial arts and to definitions of the field. Typical of the presentations was the program by Dell, Klehm, and Williams (1953) in which objectives, definitions, and aims were cited as bases for the content. These presenters quoted Bonser and Mossman's (1924) early definition, *"industrial arts is a study of the changes made by man in the form of materials to increase their values, and of the problems of life related to these changes"* (p. 5). This definition may be the first documented reference to the technological society as a purpose for teaching industrial arts. Bonser and Mossman obviously intended that the predominant characteristic of society be reflected in the curriculum. Wilber (1946) was also cited for this definition, "industrial arts are those phases of general education which deal with industry,—its organization, materials, occupations, processes and products—and with the problems resulting from the industrial and technological nature of society" (p. 2).

Technological impacts were beginning to creep into the presentations. Barich (1956) challenged that "accelerated technological advances" must be addressed by the industrial arts profession to meet one of the basic objectives. Two papers confronted the members with technology as content in industrial arts. Feirer (1958) stated that industrial arts in 1970 would be:

> 1. A curriculum geared to technology.
>
> 2. Experiments, exercises and problems as well as project making.
>
> 3. Study of tools, materials and machines and their use in our economy.
>
> 4. Solving all kinds of technical problems.
>
> 5. Students of all abilities taking industrial arts and all being challenged.
>
> 6. Design in its broadest sense emphasized.
>
> 7. Applied science and mathematics used in the shop integrated with science and mathematics courses.

> 8. Use of oral and written language and the necessary technical vocabulary emphasized. (p. 2)

Obviously, Feirer projected that change would occur more rapidly than it actually did.

In this same meeting, Yager (1958) presented a paper, "Characteristics of a technological society which should be reflected in a program of industrial arts." He said, "In the development of our age of Technology, we have had the Stone Age, the Iron Age, the Machine Age, the Age of Automation, and now we are entering the Space Age" (p. 1). Yager saw technology in a direct relationship with industry. How prophetic were his words, "changes and improvements that have taken place so far are indeed small compared to what we may expect in the future" (p. 1).

Klehm (1960) discussed the needs of a technological age in a paper which dealt more with traditional industrial arts than with technology and more with machines than with the application of knowledge. Karnes (1960) observed:

> The fact of technology as the dominant element in the culture, and the social complexities which it brings, should lead to a central, integrating purpose in industrial arts for the great majority of youth who pursue this work at the junior and high school levels. This central purpose is thoroughly consistent with the traditional definition of industrial arts. (p. 1)

The 48th Conference repeated the topic, "Changes in content in industrial arts to meet the needs of a technological age," but nothing significantly different was observed in the papers. The term, technology, appeared with greater frequency and exerted influence upon deliberations about content.

Grote (1962) raised questions about industry as a base for programs. He opened with this statement:

> The development of an understanding and an appreciation of industry as a dominant social force has been recognized as a valid central and controlling purpose of industrial arts for 50 years. During this same period of time, much thought and study has been directed toward methodological questions without adequate consideration of ends to be achieved. During recent

> years the profession has begun to use a popular phrase, "Interpretation of Industry," which remains to this day ambiguous and superficially defined. (p. 1)

Grote went on to predict:

> That the accelerating rate of technological change will have a determined effect upon education at all levels.
>
> That industry and technology will become increasingly important as a dominant social institution which will greatly affect the perpetuation and improvement of modern civilization.
>
> That the traditional content of industrial arts centered around occupations and/or media will be seriously questioned, and increased attention will be given to new means of selecting and organizing content.
>
> That the manufacturing industries will become the central agency through which the technology is integrated and made meaningful.
>
> That one cannot adequately interpret modern industry without a fundamental knowledge of the sociological structure and function of bureaucratic organizations in a capitalistic society. (pp. 2-3)

Grote was speaking the language of technology education long before it existed as a curriculum title. He did not foresee, however, that manufacturing and industry would be subsumed in technology; that technology was to become the prevalent force in all aspects of society.

Two other forces were prominent during this period which temporarily deterred or diverted technology education. These were industrial technology, which moved from teacher education and industrial arts toward the riches and enchantment of industrial employment. A strong technical emphasis with management support became popular among teacher education programs and this influence was debated in the MVC. The first of these was presented in 1963 and attempted to cover the total influence of industrial technology programs (Hauer, Barnhart, Gallington, & Groneman, 1963). The subject matter area was presented at two other conferences, 1965 and 1970 in this middle period.

The other force, vocational education, was of greater significance in delaying the inevitable position of technology education. Vocational education was always a close cousin in the development of manual arts and industrial arts. Its proponents suggested that the central purpose of industrial arts was to prepare students for entry into vocational training programs.

Passage of the Vocational Education Act of 1963 was the impetus for a new round of discussions about the vocational purpose of industrial arts. The lure of federal dollars for industrial arts became an even more powerful influence. In the later years of this period the discussion moved from "kissing cousins" status to that of "becoming bed partners" with vocational education. Nelson chaired a session in 1964 in which he, Silvius, Jarvis, and Oakley (1964) pursued the question, " What are the implications of the Vocational Education Act of 1963 for industrial arts in the public schools and for industrial arts teacher education?" The term "vocational" was visible in most all conferences for many years afterward.

It was this influence which led to the renewed use of the term "industrial education" in the MVC. This influence continued well into the recent period, and will be addressed in that section.

Technology began affecting thoughts not only about the content of industrial arts but also about its methodology. The traditional "take-home" industrial arts project did not fit well with the newer technologies. The profession was seeking ways to teach about technology. Oakley, Anderson, Reid, and Roy (1965) discussed "The conceptual approach to the teaching of industrial arts." As a forerunner of the teaching of technological concepts, this was an important development.

Methodology is also influenced by the facilities in which teaching is to occur. In 1966, Goetz, Hewitt, McWaters, and LaBounty presented an overview of the influence technology was likely to have on facilities and equipment. Their observations, too, were closely focused on conventional content areas.

This period of the middle years finished with continued debate on the objectives of industrial arts, the relationships of vocational education and general education in industrial arts, technical competencies versus conceptual learning, and a standardized or national curriculum for industrial arts. The Vocational Act of 1968 fueled this fire again. The 1970 Conference programs included topics on general and specialized educational goals, industrial technology, and justification for industrial arts at all levels; which served well as a summary of the middle period.

The Recent Period

The recent period includes the years 1971 through 1987. During that period, 197 topics were presented; of those, 32% were philosophical, 18% dealt with teacher education, 18% covered topics in administration, 13% dealt with instructional content, and the remaining 19% were scattered among the other seventeen classifications. This was a time of philosophical debates in the field. Events of the 1960s, when authority was challenged and radical changes in society were obviously not temporary occurrences, also caused serious reexamination within the field.

Subject matter analysis of this period shows dramatic shifts. There were 94 presentations coded as industrial education. This is the most predominant (48%) subject discussed during the period. The vocational funding of the 1960s, coupled with the influence of Chairman Rupert N. Evans, led to a series of debates about the name and purpose of the MVC. In 1971 and 1972 there were six presentations about the goals and future of the MVC. These debates and the subsequent discussions led to formal action to change the name of the Conference to the Mississippi Valley Industrial Teacher Education Conference. Thereafter, many of the topics carried the generic term industrial education, though subsequent examination of the papers reveals that they dealt primarily or exclusively with industrial arts.

Two new subject matter terms were introduced in this period. Career education dominated the discussion for two years (1972 and 1974), then disappeared. Technology education, the theme of this paper, first appeared in 1972 and continued to appear frequently through 1987. Of the 197 presentations made in the recent period, 48% dealt with industrial education, 22% with technology education, and 21% with industrial arts.

Changes which occurred in the period are reflected more dramatically by dividing it in two segments, 1971 through 1979 and 1980 through 1987. There were 21 presentations on industrial arts in each segment. Career education presentations appeared only in the first segment. Industrial technology experienced a mild renewal of interest during the most recent two years, when it was covered in three presentations. The focus on industrial education was strong during the first segment, with 67 presentations, but diminished during the second segment, when 27 presentations dealt with the subject. The reverse was true of technology education: of the 44 presentations on technology education, 42 were made during the second segment.

This recent period was introduced with a session, "History of the Mississippi Valley Industrial Arts Conference," presented by Whalin, Klehm, and Silvius (1971). While appropriate, the presentations were emphatic in their praise of past leaders and traditional programs and directions. There were no analyses of content or philosophies which might lead to change.

The history session and the last two sessions, "Future directions for the Mississippi Valley Industrial Arts Conference," were separated by the introduction of career education. Although the last two sessions were futuristic by title, they dealt primarily with issues on the composition of the MVC membership and consideration of appropriate names for the Conference. Little discussion is recorded to show that significant consideration was given to the changing nature of society; the emergence of the technological era.

At the 1972 Conference, career education was the lead-off topic, apparently in an effort to establish relationships between industrial arts and career education. In a session on teacher education, Sargent (1972) presented views on how innovative programs of the 1960s affected industrial arts teacher education. This is the only title reference to those programs during this period. From personal observation, however, the author recalls that the names and nature of selected innovative programs repeatedly emerged in discussions for a number of years.

Session IV of this conference was a "Debate on the primary emphasis of industrial arts." Boone (1972) took the position: "Resolved: That industrial arts should work toward combining industrial arts, technical education and occupational education under the name 'industrial education'." Streichler (1972) argued the position, "Resolved: That industrial arts should place primary emphasis on careers, involving the production of all types of material, goods and services." Lemons (1972) took the position, "Resolved: That industrial arts should place primary emphasis upon technology/society relationships," in which he presented the first argument for technological literacy or technology education by taking the position that the primary emphasis of industrial arts should be on technology/society relationships. In this paper, Lemons stated:

> Industrial arts educators must utilize human and material resources from government, labor, industry, and education. The laboratory must be expanded beyond the walls of the wood shop and the school building. The activities must include more than tools and materials. The teacher must read about, explore, and integrate himself in affairs of the society beyond that of making gavels for civic clubs. . . .
>
> Since the beginning of industrial arts, by that name, there has been this purpose of preparing youth to function in an industrial society. Today we have moved past the "industrial society" stage into a "super industrial" or "technological" period and the problems of life are more complex. Therefore, it is more important than ever before that the primary emphasis of industrial arts be toward preparing citizens to relate technology and societal conditions. (p. 8)

As nearly as the author can determine, this was the first use of the term "technological literacy" in a program of the Mississippi Valley Conference, though the term is now in common usage.

During the next two years, attention was given to current issues such as metrication, OSHA, competency-based education, and career education. In 1975, the pattern continued much the same with the exception of one session, "Changing patterns of industrial arts." In this session, two of the presentations dealt with issues arising from federal funding for vocational education, and Scherer (1975) responded to the question, "In what ways are cluster concepts affecting industrial arts?" This paper included references both to clusters and to concepts.

The impact of clusters was again addressed in 1976 by Kemp, whose topic was "What should be the role of clusters in the content and structure of industrial arts? Of industrial arts teacher education?" Clusters, of course, had their origins both in career education and in technology. At the next conference, clusters merited a full discussion session. Carrel (1977) discussed the clusters in use and the bases for them, Rudisill (1977) explored the effects of clustering, and Streichler (1977) discussed the affect of clusters upon industrial technology and industrial teacher education programs.

The 1978 program showed a renewed interest in technology education. Session V was titled, "How to live with technology," and featured Gavin (1978) on the subject of technological changes and their influence on programs. Lauda (1978) discussed "Technology as a teacher education program." Lauda's presentation is the first direct reference to technology as the subject matter of industrial arts teacher education.

Industrial technology, student recruitment and faculty development were the topics of the 1979 Conference, but in 1980 the direction of the field and content of teacher education programs were central themes. Interrelationships between industrial arts teacher education and industrial technology programs were discussed under several headings. Impacts of technology were evident as one session was devoted to "Microprocessors in industrial teacher education;" however, no direct relationship was drawn between the use of microprocessors and the subject matter direction of the field.

Israel (1980) presented a substantial review of stagnation in industrial arts. He concluded:

> The profession is not future oriented. The prescriptive practices that have worked are applied in the present. When a prescriptive process or procedure has to be changed, it is done so based upon the present and not the future. This attitude results in minimum long-range planning. (p. 29)

The MVC is analogous to a pressure valve which releases when sufficient pressure builds, or to an earthquake: pressure builds until something has to slip; and, when it does, the tremors are felt in all directions. Gradually, the use of the term, technology, had been increasing, and, in 1981, the conference program reverberated with topics on technology education. The first session was entitled, "Technology education, industrial arts, and industrial technology education." Bender (1981) spoke of the purpose and content of technology education:

> The goal of technology education is to provide individuals with the means to find order in a complex global society and to attain the knowledge, skills, tools, attitudes, and values required to participate effectively

> in the manage and control aspects of a technological society.
>
> The problem is not so much in the content as in the content structure and methodology used in the process of delivery. Traditional industrial arts programs have had rigid content that may be no longer valid in an ever-changing technological society if we are to prepare students to cope with life in the future. We have not accepted the educational challenge to prepare individuals capable of understanding the potential and limitations of technology. (p. 16)

Bensen (1981) reviewed the work of the group which met at Jackson's Mill and the implications of that work for the field. Technology and the universal systems model were suggested as the central organizers to unify efforts toward teaching industrial arts. Yeager (1981) compared definitions, content identifiers, and attitudes relating to industrial technology, technology education, and industrial arts. From survey results, he concluded that no clear distinction existed. He did point out that all three were dynamic, and that to be viable programs for the future, all would need to remain dynamic—one could not become stagnant while the others change.

In another session of this 68th MVC, the subject of "Alternative futures" was presented. DuVall (1981) reviewed technological developments holding tremendous potential for changing the way society lives and does business. He challenged the Conference participants to prepare students for a technological world:

> We can assume several stances in preparing for what is yet to come. We can assume an inactive stance and hope that change will go away. We can let others do it. We can let them continue to develop the technology. We can let things progress as they will and hope that we will be able to cope with what transpires. If we accept this plan of action it is possible that there may not be a world in 2001 that we have to worry about. Nations may, out of ignorance, destroy all of the planet's resources—and each other.
>
> One other stance is possible. We can all become increasingly involved. We can work harder to try to

> understand and control our own technology. The cause and direction for the future is apparent. (pp. 22-23)

Lacroix (1981) presented a paper on the topic, "What are the possible scenarios for the future of industrial arts ten to twenty years ahead? What programs, courses, or emphasis areas should be included in the ideal industrial arts program?" While he acknowledged that careers and industry would be a part of whatever subject is taught, he suggested that the central focus would be technological concepts.

The 69th MVC opened with "Innovation in industrial arts" and closed with a session on "Technology education." How quickly the terms which were hotly debated suddenly became commonplace. Anderson (1982) spoke of the gap between leaders and practitioners. Sterry (1982) in Session IV, "Implementation of curriculum change," observed:

> Although national and state efforts are important, the real significance of curriculum revision is that which occurs at the local level. A growing number of school districts are revising programs to better meet the needs of students today and for the world in which they will live. (p. 5)

In Session V, Lauda (1982) discussed "Three scenarios on the technology education base: (a) What would a high school program look like? (b) What would a middle school program look like? (c) What would an elementary school program look like?" After leading the members through the scope and sequence of his technology education proposal, he concluded with a challenge:

> The technology education program is designed to provide students with an understanding of the technical means that determines much of our culture. Such an education requires a thorough knowledge of the processes utilized as well as the resources required and the impacts of every decision. Technological literacy is attainable at every stage of development but increases in depth and breadth throughout life. Therefore technology education is lifelong learning.
>
> The discipline can contribute something uniquely different to the mental, social and emotional development

> of the child. We are uniquely qualified but this opportunity is available for a limited time only. . . . Technology is a human effort and other disciplines have the right to contribute to technological literacy. We have the opportunity to focus on the processes involved in the major organizers. This is our arena. (p. 17)

In this same session, Bearden (1982) discussed teaching strategies for technology education and compared them with strategies used in traditional industrial arts programs. Streichler (1982) promoted an industrial technology approach to teacher education. The use of the modifier "industrial" was frequently and hotly debated before and during this year, as it has been since that time. This obviously was a banner year for technology education. No longer were there debates as to whether there should be technology education, but rather, the discussions centered around the question of what type of technology education—a question to be debated for the next five years.

In 1983, technology education and the influence of technology on industrial arts and industrial education programs were prominent in three of the five sessions. Session I was titled "High technology," Session II, "Technology education," and Session V, "Issues and trends." The first two of these were almost totally committed to discussing technology education—its definitions, characteristics, content, and activities. The high technology session presenters spoke of technical developments, computers, integration of technology in existing programs, and costs associated with maintaining technologically current programs. There was clear recognition of the changes which have occurred technically in the world. No efforts were made to defend content and practices of the past.

The technology education session provided the most clearcut and direct definitions and descriptions of technology education of any to date. Lux (1983) provided a strong rationale for offering technology education, especially as called for by several major reports on education in the United States. He then went on to express his bias for use of the term "industrial technology:"

> These two widely-read reports demonstrate the promise and the problem of the concept "technology education." There appears to be a growing awareness of the need for technological literacy, but many are at best ill-informed concerning the need and all are confused

> about what constitutes technological literacy as well as how to provide it.
>
> If industrial arts moves boldly to provide the leadership in communicating the need for technological studies, it needs to avoid adding to existing confusion. . . . The advocates of technology education should engage in and be advocates of reality testing for their ideas and their programs.
>
> One of the main burdens of the technology educators is to get in place extensively evaluated and successful operational programs. . . . if technology educators' meaning is inclusive of all of technology, their programs must reflect the fact. If they have a selective meaning, an appropriate adjective needs to be placed with the term "technology" to show the delimitation. All of this brings us to "industrial technology" as the future of industrial arts education. (pp. 5-6)

Wright (1983) and Lauda (1983), in consecutive presentations, provided examples of activities and a rationale for technology education. Wright said:

> Technology education projects or activities should be developed backwards using the systems model by starting with the technological impact. What impact is the major focus? Once the impact has been identified then the tool and processes can be selected to actuate the project or activity. Content is then selected to provide instruction for industrial materials, processes, application and technological impact. (p. 5)

Lauda took a more direct route to justifying technology education. He stated:

> It is of paramount importance that the attitudes of people in the discipline be changed. Morbid preoccupation with the past will no longer suffice. What is needed is people who can learn from what is happening to our society and then respond to that knowledge with imagination and maximum effectiveness. Intolerable realities within the discipline should not triumph over curriculum development that addresses cultural real-

> ity. The bottom line is that content legitimacy is basically a cultural issue. We should be less worried about the heritage of the discipline and worry more about the future of children. We must realize that the best analyses of the wrong questions leaves us with elaborate wrong answers. (pp. 3-4)

In Session V, "Issues and trends," Stephens (1983) pointed out that there appears to be a significant difference between the items advertised in the magazines and journals of the field and those advertised in magazines such as *Business Week* and *Time*. In *School Shop*, advertisements for general equipment, woodwork, automotive, and hand tools constituted 51.25% of the total advertisements. When all other traditional subject matter materials are added to these, 82.52% of the advertising is accounted for; this includes electronics (5.42%) in the nontraditional group. In *Business Week*, 42.5% of the advertising was classified as computers, data transmission, and software. In spite of this evidence of the interest in current technology by the public publishing institutions, Stephens concluded:

> The major trends in industrial arts today are conservative—a continuation of the traditional. This is a general trend in education, and is expressed by some as back to the basics. I believe it is a general trend in our society: to conserve more than we have in the past forty years; to be conservative rather than liberal. (p.7)

Stephens continued with a message that seemed ambivalent:

> In the teaching of industrial arts, the student experiences—the how-to-do-it—will always reflect the tools and equipment available in the shop. The organization of instruction and the nature of the technical content should reflect the economic and political systems of our society. (p. 7)

The concentration of programs on technology education in the first few years of the 1980s seemed to make it acceptable to talk about the subject. In the next years, references to technology education are sprinkled abundantly throughout the sessions. Mintz (1984) spoke of the teaching field components of industrial arts/technology education teacher preparation. He assumed a traditional position in beginning his study:

> When I received this assignment, I read the question and interpreted it to mean: What industrial education courses should be included in the program to prepare a person to teach industrial arts? The technology education following the industrial arts was, I believe, designed to cover those programs which had, in some fashion, changed their name, but were involved in preparing teachers for programs which have for more than one-half century been known as industrial arts.
>
> One thing I have learned as the result of this survey is that not everyone interpreted the question in this manner. (p. 1)

Mintz found through surveying MVC member institutions that cluster courses, such as power and energy, manufacturing, materials and processes, and visual communications, were preferred as core courses in teacher education to traditional courses. In that same session, Smith (1984) commented on technology education in the context of change in the field. Even though the administration of Ball State University was not willing to accept "technology education" as the name for the department, it was the first choice among the names recommended by the department.

Session II was titled "Programs and Standards." Dugger (1984) reviewed the development and status of the *Standards for Industrial Arts Programs* (Standards for Industrial Arts Programs Project, 1981) and then proceeded to inform the membership of the impending revision of these as *Standards for Technology Education Programs* (Dugger, Bame, & Pinder, 1985). Bensen, Sterry, Bender, and Good (1984) described the Industry and Technology Education Curriculum Project, a project in which the Jackson's Mill structure was used to develop curriculum models. The basic premise of this project was that industry and technology are fundamentally essential areas of study.

In the fourth session, Bjorkquist (1984) reinforced an understanding that unanimous agreement on technology education did not exist. In identifying the problems of the field, he avoided making reference to technology education except in one quote. He did state, however, that industrial arts competes with technology along with science, mathematics and liberal education.

Martin (1984) presented a view on the nature of general instruction in technology in the public schools and the role of industrial arts/technology education in that effort. Martin summarized his presentation, which had dealt heavily with justification for technology education (technological literacy), with the use of the combination term "industrial arts/technology education."

> In bringing this topic to closure, it has been the premise of this paper that industrial arts/technology education must assume a more significant role in the educational arena. The profession must operate in tandem with other subject matter areas to develop and reinforce those commonly accepted process skills. The nature of instruction must focus on the overriding societal issues of a given era. Industrial arts/technology education's specific role must continue to be in providing the technical bases to understanding these issues while broadening its horizons to include the societal, political, and economic impacts. While the current purposes for offering industrial arts/technology education may be narrowly or broadly conceived (depending on one's frame of reference), its limitations are established by the very expectations of the people who choose to foster it in the public schools. A change in what the profession has to offer society is a fundamental question of planning for the future. This future must go beyond today's sacred cows and blue ribbon educational planning reformers. (p. 6)

Bobell (1984) discussed relationships between science and technology. The results of a telephone survey of school administrators reflected little understanding of the differences between science and technology but a significant difference between those and industrial arts. Industrial arts must be relegated to a support role to science and technology if it is to survive. Technology education is for all students regardless of vocational intent.

Pannabecker (1984) used the term "industrial arts" throughout to "simplify the presentation." Berryhill (1984) used the term "industrial education" throughout his presentation even though he dealt with the topic of computer usage.

There is not yet consistency in reference to the discipline. At any time thus far, the field may be referred to as "industrial arts," "industrial education," "industrial technology education," or "industrial arts/technology education." Frequently, the reference is directly to "technology education." The important trend to be noted, however, is that "technology education" now is used regularly, without question, as a subject reference in the field.

References to technology education had become so common by 1985 that it was difficult to trace the increasing impact of the use of the term. The 1985 MVC continued this emphasis to the point that not one session nor topic presented was devoid of reference to technology education. The discussions focused more on what was to be taught within the context of technology and how the subject matter should be organized. In the opening session and topic, Ruda (1985) acknowledged lack of consensus on the number and titles of clusters as well as the lack of agreement on what the field was to be called but he raised no question about the future being linked inexorably to technology. Cox (1985) and Howe (1985) used the term "industrial arts/technology" in their presentations on teacher education.

Session II of the 72nd MV[illegible]as titled "Futures." It featured three presentations, the fir[illegible] of which focused sharply on technology education. Squier (1985) offered a position at variance with the generally accepted practice of content analysis and taxonomy. He concluded:

> The challenge for the profession from Boyer, Hawthorne, and Shane is clear. We must work toward a curriculum that will deliver technological literacy. Such a curriculum will not be preoccupied with technical content, is not dominated by skill development, and provides content derived from research that is realistic in scope with content selected from a logical and rational base. (p. 19)

Squier consistently used the term "technology education" throughout his paper in the context of technological literacy. Swanson (1985), on the other hand, avoided using the term "technology education" and referred to industrial teacher education even though his title listed "technology education/industrial arts" in that order.

In Session IV, "Technology education," Forkner (1985) concentrated on the project as a method of joining traditional material areas with technology education systems. Savage (1985) used the term "industrial technology" and described laboratory content approaches for teaching it. He recognized that the laboratory content will need to be different than for previous eras:

> There are scope and sequences available that reflect laboratory content for industrial technology systems that attempt to reach higher into the upper levels of each domain of learning. This content suggests a need for creative curriculum planning and program guidance. It also reinforces the commitment that we should all have to the teaching of technology related subject matter. . . a commitment from which we cannot dare turn our back and expect to serve the teaching profession into the next century. (p. 15)

Tuttle (1985) reviewed comprehensively the various cluster approaches to define technology education. His summary provides further insight into the dynamic nature of the field:

> Many of the technology curriculum models and theories presented in this paper are very similar. It would not be to the best interest of the profession if all were in agreement. The goal of this author, with a limited amount of time and resources, was to attempt a brief overview of not only the three cluster vs. four cluster approach but to also include the professions' move toward technology education. (p. 22)

The fifth session consisted of presentations of three state curriculum plans for delivering technology education. Metzger (1985) reviewed the Illinois Plan which he referred to as for "industrial education" but made frequent allusions to "technology education." Good (1985) explained the technology sequence of the New York Regents Action Plan in which the term "technology" is used without modifiers. Kirby (1985) presented an overview of the Wisconsin Plan, which he called a "technology education" plan, but the appended state material titled it "Industrial Technology Education." Obviously, the debates on technology education were gaining in sophistication as well as frequency.

At the 73rd MVC, 11 of the 12 presentations involved technology education. References were often to "industrial arts/

technology education," but the connotation implied a transition from industrial arts to technology education. In Session I, Sterry (1986), Yadon (1986), and Lacroix (1986) spoke respectively of vocational education, clusters, and teacher characteristics in public school programs of technology education. Session II was titled "Technology education and technological literacy," with presentations by Jones (1986), Brame (1986), and Blankenbaker (1986). Jones questioned whether additional research findings would convince those who did not want to be convinced that technology education was a viable force. He reinforced the premise of this study with his statement:

> The idea of the study of technology as a part of the general education offering for students has floated through the halls of education for nearly four decades. The logical outgrowth of that idea of studying technology in an educational setting was the term "technology education." (pp. 1-2)

He concluded:

> There is ample and significant research that calls for the study of technology and that verifies the "value" of technology education as part of the school curriculum. Conversely, and although this was not a direct research question to be addressed here, no research was found (accidentally or on purpose) during this project to verify that we should continue to do what we are doing, i.e., traditional industrial arts. (p. 22)

Also during this session, Brame identified components of technological literacy and Blankenbaker related public perceptions of technology education.

Stephens (1986) spoke of liberal arts in the preparation of technology education teachers, while Wiens (1986) approached the reverse perspective, technology education in the liberal arts. Gramberg (1986) reviewed expected or projected teacher education requirements in mathematics, sciences, English, and professional education. In the final session, Devier (1986) dealt with recruitment issues, while Kruger (1986) examined compatibility issues between technology education and industrial technology.

In the final year of the 75-year period, the MVC did not feature as many topics including technology education in the titles as had been the case in the previous three years. Perhaps the debates were wearing thin or the terms were well accepted and could be subsumed in other topics. Nevertheless, the conference opened with a session on "Technological literacy," in which Carrel (1987) defined competencies, Prewitt (1987) related the acceptability of technology education in the university setting, and Frey (1987) presented a scholarly philosophical justification for technology. He said:

> Is there a philosophy of technology? Yes, there are philosophies of technology. And philosophy as a discipline has moved from considering technology as a stepchild of science (thus neglected) to asking if there are any philosophically interesting questions in technology. Recently, philosophers have moved beyond considering technology as a source of questions and begun to view the phenomenon of technology as a legitimate area of study, distinct from science. As philosophers continue to study technology, our understanding of the phenomenon will deepen and our discipline, Technology Education, will benefit. (p. 22)

In the last session, Divine (1987) discussed the field-based problems of technology education teacher education. It was fitting that the last presenter, Anderson (1987), summarized the period of technology education development. One could not have planned a more fitting conclusion to the 75 years of movement to technology education than Anderson's presentation. After a detailed comparison of technology education with more established disciplines, he concluded:

> 1. Technology education is a continuation of curriculum development and not a new awareness of an existing body of knowledge. Its content is based on the social, economic, and technological consequences of human activities.
>
> 2. The structure of the curriculum to be used to define the discipline called technology education may have reached a point of professional consensus within the last decade. However, attempts were made as early as 1924 to establish categories for organization of curriculum. . . .

> 3. The trend in publication of textbooks in technology education indicates an increased consensus regarding appropriate categories within curriculum and appropriate content.
>
> If these three conclusions are accepted, meeting those criteria of a discipline, it then seems possible to compare technology education to other established disciplines. If . . . technology education is rejected, the profession returns to a hodge-podge of information taught with some degree of randomness. (p. 23)

Conclusions

The theme of this paper has been that technology education, the development of technological literacy, is the culmination of a 75-year quest by the Mississippi Valley Conference to find relevance in content and purpose. The evidence is overwhelming that there has been dissatisfaction from the very beginning with the subject matter and a continual groping for purpose. It appears that until recent years, when technology education became more clearly defined, the field was constantly going in various directions, chasing after every fad or available source of approval (especially when funds were potentially available). Nowhere in the literature is it shown that the profession has agreed upon a direction as it has with technology. Of course, the debates will continue, and they should, to more clearly define and refine the subject field. The love affair with the term "industry" will wane as technology increasingly is seen as independent of industry.

Vocational education, career education, and industrial education are terms which have been with the field for many years, but they failed to attract and hold the profession. Clearly, they were not destined to guide the curriculum. It can be seen that these were, in fact, partial purposes to be accomplished rather than a discipline for study. It is not incomprehensible that a new societal change will sweep the world and technology will be obsolete, but that change is not evident at this time. The very dynamic nature of technology establishes a longevity which manual training, manual arts, or industrial arts could not possess. They were all rooted in the industrial era and fed upon technological development. That technology is now entering its adolescence, and its maturation period is unknown.

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EVALUATION OF OUR PROFESSION OVER THE PAST TWENTY-FIVE YEARS: QUANTITATIVE AND QUALITATIVE BENCHMARKS

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Over the past quarter of a century, much has happened to the profession of industrial arts and technology education, as well as to the Mississippi Valley Industrial Teacher Education Conference. We have moved through an era of unparalleled curriculum development in the 1960s, through the 1970s, which could be characterized as a period when the profession became more closely aligned to vocational education as a result of federal and state initiatives. The decade of the 1980s has clearly been a time of great change, when the profession has reexamined its underlying foundations and decided to adopt technology as its major curriculum theme.

Quantitative Benchmarks

During the past 25 years, there have been two major efforts to establish quantitative benchmarks for the profession. The first of these was conducted by Marshall L. Schmitt and Albert L. Pelley of the U.S. Department of Health, Education, and Welfare and reported in *Industrial Arts Education: A Survey of Programs, Teachers, Students, and Curriculum* in 1966. The second was conducted by William E. Dugger, Jr., E. Allen Bame, Charles A. Pinder, and others of the Standards for Industrial Arts Education Programs Project at Virginia Polytechnic Institute and State University (Virginia Tech) under the auspices of the U.S. Department of Education in 1981 and reported in *Report of Survey Data* (Dugger, et al., 1980).

The Schmitt-Pelley Study

Schmitt and Pelley (1966) provided, for the first time, a comprehensive review of the industrial arts programs in the public secondary schools of the United States. The study was conducted during the 1962-63 school year and reported in 1966. Before this comprehensive study, only fragmented information was available on industrial arts programs, teachers, curriculums, and students; data had been compiled only at the state and local levels.

The purpose of the Schmitt and Pelley (1966) study was to collect data which could provide information to help answer the following basic questions:

> 1. What is the instruction program in industrial arts?
>
> 2. To what extent do schools offer industrial arts education?
>
> 3. What objectives are emphasized?
>
> 4. Does the size of a school affect industrial arts course offerings?
>
> 5. To what extent is industrial arts required of all students?
>
> 6. What are the major problems confronting industrial arts teachers?
>
> 7. What is the educational background of the industrial arts teachers?
>
> 8. How many industrial arts teachers are there in the United States? (p. 1)

The study involved a stratified random sample of the public secondary schools (grades 7-12) in the U.S. Two instruments were used, one sent to the sample of 2,259 principals and the other sent to the sample of 3,040 teachers. Returns were received from 95.1% of the principals and 93.7% of the teachers.

According to the respondents, three-fourths of the public secondary schools in the U.S. had programs in industrial arts. As the school size increased, the number of industrial arts programs increased. Other findings reported by Schmitt and Pelley (1966) included:

> Of the 10 purposes of industrial arts identified on the survey forms, the following four rank highest in the degree of emphasis placed on them by both industrial arts teachers and principals: (a) to develop in each

> student a measure of skill in the use of common tools and machines; (b) to discover and to develop creative technical talents in students; (c) to provide general all-around technical knowledge and skills; and (d) to develop problem-solving skills relating to materials and processes.
>
> The objective of *developing an understanding of our technical culture* ranked relatively high among teachers but relatively low among principals. The reverse was true regarding the purpose of *developing worthy leisure-time interests*. . . .
>
> Of over 40,000 industrial arts teachers in public secondary schools, 94.4 percent hold a regular or standard teaching certificate. Nearly 20 percent of the industrial arts teachers have 20 semester hours or less in technical courses, and 21 percent have 10 semester hours or less of combined science and mathematics courses. (p. 28)

Other findings by Schmitt and Pelley (1966) indicated:

> The average number of years of teaching experience for industrial arts teachers is 9.5 years. The larger schools have the most experienced teachers. The average number of years of industrial experience or its equivalent of industrial arts teachers is 5.6.
>
> Industrial arts teachers rate the ability of their students in elective industrial arts classes as follows: 10 percent of the students were generally above average; 57.9 percent, average; and 31.9 percent, below average.
>
> Nearly 40 percent of the teachers made significant changes in their courses, as compared to the previous year, and the largest group that made changes broadened their courses to include new instructional areas. They also added new courses to meet the needs of upper ability students and to correlate industrial arts more closely with science instruction.
>
> The following seven teaching problems cause industrial arts teachers the greatest degree of difficulty: (a)

> keeping up with advances in technology; (b) arranging and conducting field trips; (c) finding adequate preparation time for experiments and demonstrations; (d) finding time to help individual students; (e) providing for the slow learner; (f) providing career guidance materials in industry; and (g) acquiring and teaching modern concepts of industry.
>
> Course titles are classified in this survey, according to instructional content, under the following headings: (a) general industrial arts; (b) general woods; (c) drafting; (d) general metals; (e) graphic arts; (f) electricity/electronics; (g) crafts; (h) power mechanics; (i) home mechanics; (j) photography; (k) ceramics; (l) industrial arts mathematics and science; (m) plastics; (n) textiles; (o) transportation; and (p) other.
>
> From 25 to 30 percent of the instructional time in industrial arts classes is devoted to theoretical or related instruction; conversely, 70 to 75 percent is devoted to laboratory activities. Industrial arts courses meet generally a full school year, five days a week, for one period a day.
>
> Concentration of subject content in industrial arts is centered in the three areas: woodworking, drafting, and metalworking.
>
> Total enrollment in industrial arts courses (boys and girls) in grades 7-12 is nearly four million. Enrollments are concentrated in the junior high school and in schools whose enrollment size is over 1,000. The highest percentage of students is found in the 9th grade, where 24 percent of the enrollment is reported. (p. 29)

The implications section of the report included these interpretations of the data:

> One of the most interesting facts uncovered by this study was the increased compulsory requirements for students (both boys and girls) to take industrial arts instruction during the period from 1954-55 through 1962-63.

An analysis of the instructional content revealed that drawing is indeed an important part of industrial arts instruction. In fact, the high percentage of drawing or planning activities in most industrial arts courses revealed the interrelationship of problem-solving and its practical application in each course.

The current industrial arts instructional program is too narrow in scope. Not only is the content narrow with respect to course offerings, but the instructional content within the courses themselves is not as broad as the professionals in the field recommend.

Although this study did not deal with the depth of instructional content, it did cast some light on the background of the teacher. More industrial arts teachers need to strengthen their science and mathematics backgrounds and keep up with advances in technology.

The industrial arts profession needs to communicate more effectively its basic purposes to the American public, to develop innovative programs which are directed to the basic purposes of industrial arts, and to substantiate the claims of industrial arts through research findings.

Although this study is a status report on industrial arts education in the public secondary schools in the United States, one major fact stands out: *The current industrial arts curriculum does not even measure up to the program recommended by the profession 10 to 20 years ago.* Yet the new curriculum suggests new structures which would reorganize the instructional content to reflect the technology around the emerging subject areas in manufacturing, communications, power and transportation, electricity/electronics, and research and development.

Massive efforts need to be taken before the *new* industrial arts curriculum or any other new approach to teaching the industrial arts can make much of an impact on the current program and eventually improve the technological literacy of the American public. (Schmitt & Pelley, 1966, pp. 29-30)

In summary, the Schmitt-Pelley study was a landmark effort which provided the industrial arts profession with its first detailed look at the programs, teachers, curriculums and students in public secondary schools in the United States.

Standards for Industrial Arts Programs Project

The second major national research effort was conducted as a part of the Standards for Industrial Arts Programs Project completed by Virginia Tech in 1978-79. This was a result of a federally funded contract to Virginia Tech by the U.S. Department of Education from 1978 to 1981. The results of the research were reported in the *Report of Survey Data* (Dugger et al., 1980). In addition to establishing a data base for the profession, the project was charged to develop a set of nationally validated standards for industrial arts, which were published in 1981.

Data Collection

The data collected in Phase I included: (a) national demographic information on industrial arts secondary school teachers and student organizations; and (b) data about qualitative elements which affect the total industrial arts program, such as facilities, content, instructional programs, philosophical views, staffing, students, and resources.

Two types of surveys were conducted to collect data. One type of survey was sent to each of the 50 state and four territorial industrial arts supervisors. (In the remainder of this paper, the term, "state" is used to designate both states and territories.) They were asked to complete the survey instrument by providing actual data, if available. If this was not possible, they were asked to supply their best estimates, based on the latest information available to them.

The other survey consisted of a packet of three optically scanned survey forms, one each for the principal, guidance coordinator, and industrial arts chairperson. The surveys were directed toward generating a nationwide profile of industrial arts education in three types of schools: (a) randomly selected secondary schools with industrial arts programs, (b) schools with American Industrial Arts Student Association (AIASA) affiliated clubs, and (c) schools with exemplary industrial arts programs. It was hoped that comparisons among the three samples would help identify the elements of exemplary programs, and thereby aid in the development of standards for industrial arts programs.

Population and Samples

The universe consisted of approximately 89,000 public schools in the United States. The target population, which was randomly sampled, consisted of a computerized list of 1,404 public secondary schools (grades 6-12) that offered industrial arts programs. A packet containing the three survey forms was sent to the principal of each school in the sample. The principal was asked to fill out the appropriate survey, forward the others to the guidance coordinator and industrial arts chairperson, collect the completed forms, and return them to the project director in a pre-addressed, stamped envelope.

A sample of 342 public secondary schools with exemplary industrial arts programs was identified by state supervisors and their staffs. The supervisors chose their own criteria to identify up to 10 schools with exemplary programs in their states. If a supervisor felt that local supervisors would be better able to identify specific schools, he/she named the school divisions that had exemplary industrial arts programs. The supervisors supplied the information necessary for mailing the survey packets to the principals of the selected schools. Those principals were sent the same packet as the principals in the random sample.

The third sample of 572 schools, those with AIASA-affiliated student organizations, was identified from the AIASA official roster. The principals of these schools were sent the same survey packet the other principals received. Surveys were coded prior to mailing to distinguish among the three types of samples.

Survey Return Rates

Of the 54 surveys sent to state supervisors, 53 (98.1%) were returned. However, only 50 of the surveys contained usable data (three were completely blank). Many questions were not answered on some of the 50 returned survey instruments which were considered to be usable.

In the random sample, 836 (59.5%) of the 1,404 schools responded, with 719 (51%) schools providing usable data. All three surveys were returned by 608 schools, while 95 schools returned one or two of the three surveys in the set.

In the AIASA sample, 378 (66.1%) of the 572 schools responded with 353 (61%) schools providing usable data. All three surveys were returned by 272 schools, while 49 schools returned one or two of the three surveys in the set.

In the exemplary sample, 201 (58.8%) of the 342 schools responded, with 191 (55.8%) providing usable data. All three surveys were returned by 129 schools, while 32 schools returned one or two of the three surveys in the set.

Schools which were included in more than one sample, for example an AIASA-affiliated school that was also in the random sample, were called overlaps. In the random sample, 16 completed sets of surveys were received from overlap schools. Overlap schools in the AIASA sample returned 32 completed sets of surveys, as did 30 (8.8% of the 342) overlap schools in the exemplary sample.

Findings

The data collected through these surveys were grouped into eight sections, or chapters, which were: philosophical views, instructional program, students, student organizations, teachers, facilities, finance, and evaluation in industrial arts education.

Philosophical views. Philosophical views were examined to assess the current philosophy of the profession toward industrial arts education, to compare current views with those indicated in the 1962-63 study conducted by Schmitt and Pelley (1966), and to determine what the future emphases of industrial arts education might be.

According to the responses of principals, industrial arts chairpersons, and guidance coordinators surveyed, the current degrees of emphases on the purposes of industrial arts education have changed little in the 15 years since the Schmitt and Pelley study. Dugger et al. (1980) found that developing in students "a measure of skill in the use of the common tools and machines" was collectively ranked first among the 12 purposes by a majority of all respondents. Providing "general all-around technical knowledge and skill" and discovering and developing "creative technical talents in students" were rated either second or third by all respondent groups. Providing "technical knowledge and skills" was ranked somewhat lower by respondents in the Schmitt and Pelley study, but the other two purposes were similarly ranked in the two studies. However, when respondents were asked to rate the ideal, rather than current degree of emphasis on each of the 12 purposes of industrial arts education, only the top-rated current purpose maintained its high rating. The respondents indicated that providing "technical knowledge and skills" should ideally be emphasized less than it is currently being emphasized, while developing "problem-solving skills related to materials and processes" and "helping students make informed educational and occupational choices" should be emphasized more.

Another major question addressed was the relationship of industrial arts to the rest of the school curriculum. The principals, coordinators, and chairpersons were asked to indicate whether industrial arts was most nearly allied with "general education, college preparatory programs, or preparation for vocational-technical education." The industrial arts chairpersons' respondent group included a few persons who chose the college preparatory or vocational-technical education categories, but overall, all three respondent groups overwhelmingly divided their answers between the two categories of general education and preparation for vocational-technical education.

In the random sample, 44.2% of the principals stated that industrial arts was most allied with general education, while 35.6% of them stated that it was allied with preparation for vocational education (20.2% of the responses were missing). From the AIASA sample, 44.8% of the principals responding stated that industrial arts was most allied with general education and 38.5% stated that it was allied with preparation for vocational education (16.7% of the responses were missing). In the exemplary sample, 40.3% of the principals said that industrial arts was most closely allied with general education, while 41.4% stated that industrial arts was allied with preparation for vocational education (18.3% of the responses were missing).

Instructional program. In 1978-79, 54.7 (F.T.E.) supervisors were reported in 45 states; four of the states had no supervisor; seven of the states had a supervisor less than full time. The notion that several times the present number of supervisors is needed was the consensus of supervisors, who indicated that 179 supervisors were needed at the state level.

One of the activities in which state-level supervisors were engaged was the development of "master plans for the scope and sequence of industrial arts courses." In 1978-79, 28 states had such plans and 9 of the 19 states that did not were planning to develop a master plan by 1982. The master plans of 14 states included student club activities, and 40 states had state vocational education plans that included industrial arts education.

Even though industrial arts education was seen as most nearly allied with general education by over one-third of all respondent groups, the purposes of industrial arts education most obviously associated with a general education approach (consumer education and understanding the relationships between technology and culture) were among the bottom three in current emphasis, according to most principals, guidance coordinators, and chairpersons. Perhaps in support of a general education approach, 100% of the guidance coordinators reporting said they believed college-bound students should take industrial arts courses.

The requirement that industrial arts courses should be taken by all students can be viewed as an indication of a strong belief that industrial arts is a part of general education for all youth. Principals were asked if industrial arts should be required for all students in their schools. The majority of the respondents in all three survey groups replied negatively to this question. Less than one-third of the principals said that their schools required any industrial arts courses. Similarly, fewer than one-third of the principals in all three samples said they thought their schools should require industrial arts for all students. However, in the AIASA sample, 14.2% of the principals reported that industrial arts was required in their schools. Also, 21.3% of those principals indicated that industrial arts should be required for all students. In all three samples, nonetheless, the clear majority of principals stated that industrial arts was not and should not be a required course for all students in their schools, even though principals also said they felt industrial arts is allied with general education. This would seem to indicate that industrial arts would not be generally accepted as part of a core curriculum in the secondary school, but rather as a non-required option.

When the group was divided into junior high school principals and senior high school principals, a different perspective was apparent. Although over 90% of the high school principals in all three samples did not think that industrial arts should be required for all students in their schools, the junior high school principals were not as unified in their opinions. A minority

(60.3%) of the junior high school principals in the random sample thought industrial arts should be required for all students, while slightly less than one-half (45.9%) of the exemplary sample and approximately one-fourth (26.5%) of the AIASA sample principals held this view. Over three-fourths (78.6%) of the principals of combination junior and senior high schools in the AIASA sample felt that industrial arts should not be required. Combination junior and senior high school principals in the random and exemplary samples were nearly evenly divided on this question, with just over 53% of the principals in both samples saying that industrial arts should not be required.

Principals were divided on the question of whether industrial arts should be an "integrated" part of the elementary school curriculum, with about one-third each saying, "yes," "no," and "no opinion." When chairpersons were asked a slightly different question, "should industrial arts be offered," rather than, "be an integral part of," a majority indicated they felt industrial arts should be offered in elementary school.

With 46 states reporting data, there were 20,230 public secondary schools, of which 15,315 had industrial arts programs. In 20 states, 2,050 of the schools received federal funds for industrial arts. In those schools that require students to enroll in an industrial arts course, the seventh and eighth grades were the predominant grades where the course was required, as reported in all three samples.

If industrial arts teachers are interested in making courses more appealing to students, guidance coordinators made several recommendations, including placing increased emphasis on the project approach to teaching. To make industrial arts courses more accessible to students, the coordinators recommended relating those courses to other school subjects and having improved laboratory facilities.

In discussion of the instructional program, state industrial arts supervisors indicated that three of the characteristics of an exemplary program are: having a dedicated and prepared teacher, having a well-equipped laboratory, and using a variety of effective teaching methods.

An examination of the types of courses taught in secondary school industrial arts programs revealed a narrowing of the range of course offerings since the Schmitt and Pelley report. The most frequently listed representative industrial arts courses taught in 1978-79 were general woods, general metals, general industrial arts, mechanical drawing, and architectural drafting. To assess how the curriculum in industrial arts might be changing in the near future, state supervisors of industrial arts and chairpersons were asked to indicate which courses they planned to add. The supervisors most frequently listed power and energy, communications technology, and materials processing as the courses they planned to add by 1981. The chairpersons listed plastics, graphic arts, electricity, and general metals most frequently as the courses they planned to offer by 1984.

According to more than half of the guidance coordinators, the industrial arts teachers in their schools provided students with a "moderate" amount of career information. About 50% of the coordinators said more career information should be provided.

According to over one-half of the guidance coordinators and industrial arts chairpersons in all three samples, students who were enrolled in industrial arts classes had the same level of academic ability as the members of the general student population. Approximately one-third of these respondents perceived the academic abilities of industrial arts students to be lower than those of the general student population. Less than 9% of the chairpersons and guidance coordinators in all three samples thought industrial arts students were above average in comparison to the general student population.

Students. The majority of industrial arts chairpersons reported that industrial arts teachers do not participate in the preparation of the individualized educational program for handicapped students. The percentage of handicapped students in industrial arts courses was less than 10% in representative courses. Overall, the greatest number of special needs students enrolled in industrial arts classes were classified as "disadvantaged," with students with a specific learning disability having the next highest enrollment. The deaf-blind student category of special needs showed the smallest enrollment in industrial arts classes.

The enrollment of females in industrial arts courses was far below that of males. The survey data provided an indication that some efforts were being made to increase the enrollment of females. Guidance coordinators gave high ratings to the potential of industrial arts for breaking down stereotyped roles for females. Principals indicated that allowing females to enroll in industrial arts courses and encouraging counselors to advise females to take industrial arts courses were the initiatives most often taken to increase female enrollments in those classes.

The courses most frequently cited as having females enrolled were: general woods, general metals, mechanical drawing, drafting, and general industrial arts. However, the courses which were named as having the highest percentages of females enrolled were more non-traditional courses such as fluid power and plastics technology.

Student organizations. Approximately 33% of the exemplary sample schools reported that they had an industrial arts student organization, compared to 14% of the schools in the random sample. Student organizations in the exemplary sample averaged 51.3 students; those in the random sample averaged 33.6 students.

Principals of AIASA schools held more positive views of AIASA than did principals in the other two samples. Over one-third of the principals in the random sample and one-fourth of the principals in the exemplary sample had never heard of AIASA.

A staff person was assigned responsibility for the supervision of industrial arts clubs by 40% of the supervisors; this assignment typically required approximately one-third of their time. Teachers who were sponsoring student organizations reported that their preparation for this task had been provided by college courses and by inservice training programs.

According to the reports, 65% of the student organizations received no financial support from the state; the support which was received usually was for travel expenses. At the local level, the clubs major sources of funds were membership dues and fundraising activities.

Teachers. The study revealed an increasing shortage of teachers during the late 1970s. Supervisors reported 812 unfilled industrial arts teaching positions in 27 states in 1976-1977, 838 vacancies in 32 states in 1977-1978, and 1,077 unfilled positions in 34 states in 1978-1979. The reports for 44 states in 1977-1978 included 55,953 industrial arts teachers, 1% of whom were female. In 1978-1979, approximately 94% of industrial arts teachers held at least a bachelor's degree.

Facilities. Industrial arts chairpersons listed more than 50 kinds of unit laboratory facilities. In addition, approximately one-half of the respondents reported general laboratories; the four most commonly listed were general woods, drafting, general industrial arts, and general metals. Construction plans for 238 general and 284 unit laboratories were reported by 15 state supervisors. Graphic arts, metals, plastics, and woods were the unit laboratories most frequently planned.

The general laboratories more likely to be found in the exemplary programs than in schools from the random sample were graphic arts, home mechanics, manufacturing, plastics, and research and development.

Finances. The highest average annual expenditures for industrial arts equipment ($4,203) and supplies ($6,653) was reported by schools in the exemplary sample. The average expenditures for equipment ($1,806) and supplies ($2,505) by schools in the AIASA sample was considerably lower than the average amounts reported by schools in the exemplary sample; this was true in schools of all sizes. Many of the schools furnished some supplies free to students: 60.4% of the exemplary sample; 50.8% of the random sample; and 49.8% of the AIASA sample.

The majority of industrial arts teachers who received supplemental pay for activities were receiving pay for coaching or working with athletic contests; however, a high percentage of the teachers received no supplemental pay for activities (49.5% in AIASA schools; 32.5% in random sample schools, and 33.3% in exemplary sample schools). While teachers in AIASA schools were less likely to receive supplemental pay for extra activities, a higher percentage of schools in that sample (16.2%) did provide supplemental pay to teachers for sponsoring industrial arts club activities. Only 5.1% of random sample schools and 8.3% of exemplary sample schools provided supplemental pay for that activity.

A total of 28 states reported receiving federal funds for industrial arts programs. Twenty supervisors reported that none of the industrial arts courses which met the criteria for federal funding were actually receiving those funds. In some schools, special funds were being provided for students with special needs who were enrolled in industrial arts courses. Students classified as "disadvantaged," "special learning disabled," and "mentally retarded" were most often listed as the special needs students for whom schools were receiving special funds.

Evaluation. A system to evaluate industrial arts programs should include course content, facilities, and funding, according to approximately 90% of the responding industrial arts chairpersons. In looking at existing industrial arts programs, at least 45% of the chairpersons in all three samples perceived course content to be the greatest strength of their programs, while at least 41% of them regarded funding as the greatest weakness.

Approximately 70% of the state supervisors said that industrial arts items should be included on state minimum competency tests. Only 4.7% of the schools in the random sample included industrial arts items on such tests at the local level, while 9.4% of AIASA sample schools and 5.4% of exemplary sample schools did so. Minimum competency tests were reported to be in use in 32 states. Approximately 70.2% of the industrial arts programs reported using some sort of regular and systematic program of student evaluations.

The research conducted by the Standards for Industrial Arts Programs Project provided an excellent perspective into what was happening at the time the study was conducted. The data provided an important benchmark for the profession, one which should be useful in future comparisons, as well.

Qualitative Benchmarks

In the 1980s, substantive efforts have been undertaken to improve the quality of industrial arts/technology education programs in the United States. This work has been facilitated through the availability of nationally developed and validated standards and accreditation criteria.

Standards

The original *Standards for Industrial Arts Programs* (Standards for Industrial Arts Programs Project, 1981) were developed for use in improving the quality of industrial education in the secondary schools of the United States. The standards were developed during 10 workshops involving participants from 50 states and 3 territories. The first four workshops were developmental in nature, providing the opportunity to develop broad standards for the profession and specific criteria for measuring those standards. During the next three workshops, the standards were further refined and expanded. Special workshops were held to ensure that the standards provided for the inclusion of criteria for industrial arts student organizations and that adequate guidelines were provided for serving special populations. Three review workshops involving professionals from widely separate geographic areas were held to validate the proposed standards and provide limited field testing. In addition, review seminars were conducted at national conferences of the American Industrial Arts Association and the American Vocational Association. This process provided input from over 400 professionals.

The original standards were comparative statements dealing with 10 major topics. Within these topics, 235 specific measures were provided. Schools could use the standards as criteria in determining whether their program met, exceeded, or did not meet each of the specific measures. Once this determination was made, persons assessing the program could prepare a summary graphic profile and write expository comments concerning the strengths and deficiencies of the industrial arts program in a school.

In 1985, the *Standards for Industrial Arts Programs* were revised to provide the *Standards for Technology Education Programs* (Dugger, Bame, & Pinder, 1985). This revision reflected the transition within the profession toward the use of technology as the major curriculum organizer for the profession. The revised standards were designed to be used as a guide to enhance the quality of the instructional program in technology education; to identify staff development needs; to establish appropriate ways to ensure safe working conditions and practices; to identify ways of promoting the technology education program; and to point out specific deficiencies in the physical environment.

The *Standards for Technology Education Programs* included 241 measurable criteria covering the 10 major headings from the initial standards: philosophy, instructional program, student populations served, instructional staff, administration and supervision, support systems, instructional strategies, public relations, safety and health, and evaluation process.

Philosophy. These 18 measurable criteria depict how the philosophical statements undergirding technology education should be developed and used.

Instructional program. These 29 statements encompass the use of the program goals and objectives in the development of course content, and in the scheduling of courses in technology education.

Student populations served. This topic includes nine statements that specify why all students, including those with special needs, should be served in technology education.

Instructional staff. The criteria expressed in these 21 statements identify legal and regulatory qualifications, professional responsibilities, and personal qualities needed by technology education teachers.

Administration and supervision. These 31 statements deal with staffing the technology education program, identifying program planning procedures, and monitoring the program through proper data collection and reporting practices.

Support systems. These 36 statements specify the human, physical, and financial resources required for a quality technology education program.

Instructional strategies. The 19 statements listed under this topic deal with proper planning and with the use and evaluation of teaching practices in technology education.

Public relations. These 18 statements outline appropriate ways of involving selected populations in the support of a quality technology education program.

Safety and health. The 47 statements under this topic specify how learning experiences and facilities should be designed and maintained.

Evaluation process. This topic consists of 13 statements which identify a systematic process of collecting, analyzing, and reporting data for decision making in technology education.

Numerous states and large numbers of local school systems have adopted the *Standards for Technology Education Programs* as they were written and published. Others have made adaptations to better reflect the needs of the individual states or school systems.

There has been convincing evidence that the two sets of standards helped industrial arts/technology education personnel in the respective localities and states to assess the quality of their programs. In many instances, the standards served as important catalysts for program improvement.

Accreditation Criteria

The accreditation of schools in the United States has been an evolutionary process during the past century. The National Study of School Evaluation and its antecedents, the Cooperative Study of Secondary School Standards and the National Study of Secondary School Evaluation (NSSE), have been concerned since 1933 with the identification of the characteristics of good secondary schools and with the development of means for evaluating schools (National Study of School Evaluation, 1987). NSSE is an incorporated professional organization composed of 22 representatives of the 6 regional accrediting associations.

In the NSSE instrument, *Evaluative Criteria, Sixth Edition*, technology education is treated as a basic fundamental study for all persons, regardless of educational or career goals, even if related specialized vocational programs are offered. In this document, the major categories for evaluation are: major expectations of the technology education program; follow-up to previous evaluations; organization for instruction in technology education; description of technology education offerings; components of the instructional program; facilities and equipment; the learning climate; evaluations and judgments; and recommendations made by the visiting team. This recently issued set of NSSE criteria should have a major impact upon the development and assessment of quality programs in technology education in the future.

Summary

During the past 25 years, evaluations in technology education and industrial arts programs have utilized both quantitative and qualitative measures. We know, to a certain degree, what we have been doing and we know how well we have been doing it. There is ample evidence from the data that much needs to be done to improve the programs in these curriculum areas. Most certainly, there is lack of consensus on the overall objectives and purposes of our profession.

Curriculum developers need to develop new courses that truly reflect technology education rather than replicating cluster-based materials that have lacked success in application. Exemplary models in technology education must be established on the national scene. Teachers must be motivated to implement the technology education curriculum and must be provided adequate inservice opportunities to prepare them for that responsibility. New teachers must be recruited and trained in technology education. Effective public relations programs must be initiated and implemented. Supervisors must be challenged to bring about true and meaningful change toward the implementation of technology education rather than passively accepting a name change while retaining the curriculum of 25 years ago. New leaders must be developed to carry our profession ahead—to fight for our cause as a viable, relevant subject area that will benefit every child in the public schools.

And finally, evaluation systems must be established to assist us in providing specific information about the technology education program area. Throughout this important process of inquiry, we can make better decisions about technology education in the future.

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RESEARCH METHODS IN INDUSTRIAL EDUCATION: HERITAGE AND PROSPECT

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Many academic disciplines have experienced significant change in research methods in the second half of the 20th century. Analyses of such change have been done by Kammen (1980) for history, Kuhn (1962) and Piaget (1967) for the sciences, Ehrmann (1966) and Ducrot and Todorov (1972) for literary criticism, and Staudenmaier (1985) for the history of technology. Although curricular content in industrial education has experienced extensive change, its research methods have changed little. It is important, however, that industrial education understand its own methodological heritage and implications for future research.

The methods of doing research cannot be separated completely from the object or research problem. That which can be discovered is limited by the method; yet the research problem also determines, to some extent, the type of method which can be used. Hence, the researcher's understanding of the limits of what can be discovered depends on the researcher's awareness of methods. These issues are epistemological in nature and are part of understanding the subject-object relationships in any discipline.

In recent years, four factors have contributed to increased complexity in methodological issues in industrial education: (a) expansion or changes in program and content emphasis (e.g., technology education and industrial technology); (b) increased expectations for methodological self-consciousness; (c) growth and maturation of programs in the history and philosophy of technology, science, and society; and (d) greater methodological diversity in the field of education.

Changes in research methods are inherently part of the process of epistemological change in any field and education is no exception (e.g., Smith, 1983; Allender, 1986). But what is the nature of epistemological change in industrial education? What has been the effect of that change on research methods? To what extent are curricular content changes driving changes in research methods? How does one determine an appropriate methodological approach? What are the growing areas of research and what is the effect on research of expanding methodological options? What has determined the present preference for certain methods in industrial education? Which types of problems have been neglected due to methodological narrowness?

Purpose

This study has three main purposes: (a) to define and examine distinguishing characteristics and types of research methods; (b) to compare methodological preferences in industrial education research in 1936 and 1988; and (c) to assess the current research environment and implications for research methods in industrial education. These three purposes coincide with the three main sections of this report.

The first section constitutes an analysis of key epistemological and methodological aspects of research. Although one of the best known conceptual frameworks in industrial education (Towers, Lux, & Ray, 1966) raised epistemological issues, its primary focus was the structure of knowledge, not the means of producing knowledge, knowing, or conducting research.

The second section is a historico-critical analysis of the development of research methods in the Mississippi Valley Industrial Teacher Education Conference (MVITEC) with emphasis upon a brief period of special interest in research methods in the 1930s. This section includes a comparison between MVITEC member opinions on research methods in 1935-36 and in 1988. The third section then examines contemporary research methods and epistemological issues as they relate to the methodological characteristics introduced in the first section and the historical context of the second section.

Analytical Framework: Heritage and Prospect

Although it might be convenient to have a single, widely accepted framework for analyzing the epistemological and methodological bases for generating knowledge, no such framework exists, particularly for interdisciplinary fields such as industrial education. Nevertheless, some coherent means of organizing epistemological approaches and research methods is necessary.

Piaget (1967) provided one of the most comprehensive frameworks for the natural and social sciences, certain aspects of which are incorporated in this study. Piaget's framework does not, however, accommodate the praxiological emphasis of industrial education and other technology-related fields of study.

For the purposes of this study, I have chosen to focus on three key distinguishing characteristics of research methods: (a) synchronic-diachronic; (b) subject-object structures; and (c) qualitative-quantitative. There are, of course, many other aspects that could be examined; however, these three aspects are particularly useful in describing and analyzing research methods in industrial education.

I have chosen not to make a detailed analysis of some of the current educational debates and terminological complexities raised in the literature (e.g., Smith & Heshusius, 1986; Miller, 1986). Some of the issues now being debated have already been treated by Piaget (1967) and others in a less polemical fashion and have often been central to academic debates throughout history (e.g., medieval nominalism and realism).

Synchronic/diachronic

This first distinction is based on the role of time or sequence. The term "synchronic" refers to a notion considered at one point, period, or cross-section in time (e.g., a note in a musical score, a phoneme in a word, a word or syllable in a sentence, the blanking of a washer, or a presidential term of office). The term "diachronic" refers to a sequence or chronological progression (e.g., a musical score, an entire phrase, a text, the industrial production of washers, or a series of consecutive years). This distinction is based on relative divisions of time and is applicable to almost any analysis, including an analysis of disciplines (e.g., Saussure, 1931; Barthes, 1964; Piaget, 1967).

For example, Dyrenfurth and Householder (1979) considered research during the period 1968-1979 as if that period were a point in time, that is, they performed a synchronic analysis. However, at one point, they presented data in a "topic" by "year" matrix (pp. 139-143), which would have been a diachronic analysis had the emphasis been on the sequence of changes. Many of the results from scientific experiments are analyzed as if the sequence happened at one point in time. The concept of replication focuses on whether the same thing would happen under the same conditions at a different point in time.

A diachronic analysis emphasizes the importance of the passage of time. For example, a reviewer could choose to emphasize the progression or change in research interest during the 1968-1979 period noted above. Although an 11-year period may appear too brief for such a diachronic study, it is important to remember that detailed historical studies of wars frequently are devoted to much shorter periods of time.

Disciplinary parameters are often determined in part by a synchronic or diachronic emphasis. History is primarily diachronic; physics and chemistry are primarily synchronic. Kuhn's (1962) work was diachronic in emphasis, but he was also interested in the relationship of the diachronic to contemporary science (viewed synchronically). Hence, this dichotomy represents an important conceptual distinction, especially for contrasting emphases and purposes in research.

Subject-Object Structures

In all research there is a relationship between a subject, that is a "knowing subject" or researcher, and an object (e.g., problem, population). The word "subject" is used here in its epistemological sense, not in the sense of individuals who participate in an experiment. Scholars studying logic, linguistics, grammar, and epistemology are especially interested in this fundamental relationship and the elaboration of formal structures that describe the subject-object relationship. In much scientific research, the subject-object relationship is highly repressed, a mode of thinking which may be necessary for the achievement of a consensus of objectivity.

Piaget (1967) manages this apparent difficulty by splitting the subject in two parts. For him, objectivity does not in any way exclude the activity of the subject in the act of knowing. Piaget distinguishes two aspects of the subject: (a) the "epistemic subject" to designate that which is common to all subjects at the same stage of development; and (b) the "individual subject" to designate that which is peculiar to a particular individual. Thus, in scientific knowledge, there is a collective movement towards the epistemic subject. In a philosophical system, on the other hand, there is an emphasis on the totality of experience, but with an accompanying emphasis on the subject's personality and the ideology of his or her social group.

In industrial arts and technology education, the professed interest in the socio-cultural and philosophical implications of technological change extend the borders of knowledge beyond the scientific. Within the narrow confines of the application of scientific principles and methods to educational problems, the epistemic aspect is emphasized. On the other hand, any research purporting to study values, philosophical and historical issues, or socio-cultural change must deal with a much broader method of knowing than that which the scientific method pretends to achieve. Positivist science tends to deny that its theories are value-laden, while philosophical systems are too varied to reach a consensus. This complex issue is central to much of the current epistemological debate in education (e.g., Smith 1983; Howe, 1985).

Qualitative and Quantitative Research

Although the terms "quantitative" and "qualitative" have important and appropriate usages, the dichotomy "quantitative vs. qualitative" with regard to research methods often leads to artificial distinctions, oversimplification, and narrow conceptions of the research process. The concept of measurement is fundamental to any kind of quantitative analysis. Measurement implies the existence of discrete "real" things or objects to be measured. Positivist social science, in adopting traditional natural science concepts and methods, assumes similar notions of measurement, however, of discrete human subjects. Hence, quantitative research tends to be associated with positivist science and its emphasis on measurement.

On the other hand, qualitative research tends to be associated with descriptions and analyses of qualities, characteristics, structures, and relationships accompanied by a de-emphasis on measurement. The term "qualitative" is often used to refer to research that is more reflective on epistemological aspects and assumptions of research methods. The complex epistemological issues involved in differing perceptions of the subject-object relationship usually has some part in this reflection.

In some cases, this dichotomy has contributed to terminological abuses, for example, the use of the general term "qualitative" to refer to a specific disciplinary method such as "anthropological" or "ethnographic" research (e.g., Bogdan & Biklen, 1982). The problem is compounded by imprecise distinctions and definitions, often the consequence of the de-emphasis on measurement. But this is certainly not always the case, as is evident in structuralism, modern linguistics, and semiotics where the precision of definitions and distinctions is emphasized. It must also be noted that some of the persons best known for their self-awareness and reflection on methodology are associated with the scientific world, for example, Husserl, Einstein, Koyre', Piaget, and Heisenberg. Any simplistic separation or assignment of research methods to so-called "qualitative" and "quantitative" categories must be viewed with some skepticism. (For specific treatment of this subject and references in the field of education, see Smith and Heshusius, 1986; Miller, 1986; and Allender, 1986.)

Classification of Research Methods

The classification of research methods is inherently problematic due to the possibility of multiple organizing criteria and the lack of consensus. In certain disciplines, the presence of internal differences (e.g., structuralism in anthropology; semiotics in literary criticism; cognitive and experimental psychology) would prevent consensus even if standard classificatory criteria were adopted. For Piaget (1967), there is no epistemology independent of the sciences. Heidegger (1966) also seemed to confirm this view in asserting that philosophy now develops primarily with respect to science. Piaget (1967) established a trichotomy of theories of knowledge defined with respect to scientific knowledge: (a) metascientific—those that emerge from a reflection on the sciences and tend towards a general theory of knowledge (e.g., Hegelian dialectic, dialectical materialism); (b) parascientific—those that build on a critique of the sciences (e.g., phenomenology); and (c) scientific—those that remain in the interior of a reflection on the sciences (e.g., biology, physics, psychology). Other classification themes, though useful, are usually not as broad as Piaget's.

Methodology of Industrial Education Research

One of the primary assumptions of this study is that knowledge of the process (diachronic) of the adoption of research methods is essential to understanding present methods, attitudes, and problems in industrial education. Writers such as

Koyre' (1939) and Kuhn (1962) have emphasized and illustrated the historico-critical method in clarifying epistemological issues and change in the sciences.

The purpose of this section is to examine the historical development of research methods within a clearly delineated environment as expressed in the MVITEC papers on research methods from 1909 to 1960. Although this body of literature does not represent the entire field, it does represent a significant regional area of about 20 states, and reflects the perspectives, interests, and professional training of a large proportion of industrial education faculty in American institutions of higher education. Included in this section are results of a 1988 replication of a 1935-36 MVITEC study of research methods.

Research in industrial education was influenced primarily by the broader field of education in which it developed, both conceptually and institutionally. References in early MVITEC papers included introductory educational research textbooks such as Good (1928), Crawford (1928), and Abelson (1933). Although these texts differed somewhat in emphasis, they tended to resemble each other in a general practice-oriented approach, covering a variety of techniques.

Practical issues: An Overriding Concern: 1909-1960

During the period from 1909-1960, there were relatively few MVITEC papers that addressed the subject of research methods. The title of the first MVITEC discussion, "Our Unscientific Attitude" (Selvidge, 1909), implied that reflection on methodology was of some concern. However, excluding the 20th-year and 25th-year program reviews of Bawden (1929; 1934) which alluded to questions of methods, I identified 15 papers that addressed research methodology explicitly. Of these 15 papers, about half addressed methodological issues in depth and these papers were clustered in the five-year period 1931-1936.

The practical side of research was of particular interest. Both Lewis (1932) and Schmidt (1933) referred to the distinction between "pure versus practical research." Bawden (1929, 1934) emphasized the practical side of research in his summaries of MVITEC work by noting the importance of "profitable lines or directions of research" and the setting up of "machinery for making practical use of the foundation work already done" (1934, pp. 19-20). This interest can be related to concerns raised by textbook authors such as Good (1928), who tended to emphasize the practical, and Abelson (1933), who de-emphasized the opposition of "pure vs. practical" research.

It is clear from papers of the early years that solving the practical problems of a relatively new educational field was the overriding MVITEC concern. It is also clear that the period from 1931-1936 was a time of reflection on how manual arts as a field fit into the broader academic world in terms of its knowledge base, research, and theoretical concerns. Reflection on research methods was part of this broader period of growth in academic consciousness. Except for the survey done by Cleeton (1935, 1936) to determine MVITEC member attitudes toward research topics and methods, the historical evidence reflects the orientation of particular authors. I have chosen first to summarize the theoretical orientation of particular authors and then to proceed to MVITEC member preferences in 1935-36 and 1988.

Research Methods: Theory

The authors of the papers on research emphasized the importance of following systematic methods as used in the broader field of education. Much of the content of the papers seems to be drawn directly from educational research textbooks of the time, rather than from independent study and critique of dominant theories and their philosophical foundations. The overriding concern of the authors of papers on research methods was the confirmation and dissemination of methodological approaches needed to establish the field on an acceptable research footing within the broader field of education.

Cleeton, for example, was already emphasizing the importance of statistical analysis in his 1931 paper. Lewis (1932) presented a general summary of research techniques as used in education, emphasizing four principal methods: historical, experimental, statistical, and philosophical. Schmidt (1933) gave a brief overview of selected characteristics of research and Cleeton (1935) emphasized scientific research and statistical analysis. Curiously, Cleeton, citing the "National Research Council," considered the inductive method to be "the method of scientific research," and did not even note the importance of deductive reasoning in scientific research.

Mays (1934) summarized the growth of literature in the field, beginning with the books of the late 19th century that promoted industrial arts as a school subject. According to Mays, by the 1930s, graduate facilities were growing, thus stimulating objective study using scientific procedures of investigation. On the one hand, the field had clearly evolved, with the period 1931-36 reflecting a heightened awareness of the importance of systematic research based on explicit methods. On the other hand, there seemed to be little conscious reflection on the limitations of positivist social science, its highly synchronic emphasis, and its preoccupation with measurement. What is most remarkable, however, is not the lack of reflection or critique of educational research methodology during this period but the apparent discontinuation of methodological reflection after the 1931-36 period.

Research Methods: Perceptions and Preferences

The preceding section was based primarily on papers that reflect the theoretical orientations of their authors. This section is based upon the perceptions and preferences of two groups of MVITEC members at two distinct points in time, 1936 and 1988, as reflected in their responses to essentially the same questionnaire. This questionnaire was first used by Cleeton (1935; 1936). His 1935 report was based on 12 respondents; his 1936 revised report included results from eight additional respondents for a total of 20.

There are, of course, a number of limitations associated with such a questionnaire. For example, respondents were forced to choose "yes" or "no" and had little opportunity to critique the conceptual or ideological bases upon which the questionnaire was constructed. Respondents were not asked to prioritize research methods, but simply to indicate whether or not a particular technique, such as survey methods or the controlled interview method was appropriate for industrial arts. (Note that the phrase "industrial arts" was modified to "industrial arts/technology education" in the 1988 questionnaire.)

The 1988 data were generated under very similar conditions (e.g., MVITEC active member population, similar membership requirements, data collection procedures) at a very different point in time. Hence, responses should be an accurate indicator of the shift of research method ideology in the organization. The timing of my research and publication schedule permits only a preliminary summary of results here (based on 84% return from

57 active members).

MVITEC members in 1936 and 1988 considered the method of research as contingent on the subject of research (1936-90%; 1988-90%). They did not consider a reading knowledge of a foreign language (German or French) to be a necessary qualification for research (1936-100%; 1988-100%) and held the collecting of historical evidence from original sources to be entitled to rank as a research procedure (1936-90%; 1988-96%).

In 1936, 45% of MVITEC members considered a thorough knowledge of statistical method to be a necessary qualification for research; in 1988, 57% of the members indicated their support for this statement. Support for questionnaire methods increased (1936-75%; 1988-94%) as it did for survey methods (1936-70%; 1988-89%) and bibliographic work (1936-50%; 1988-67%).

Three major shifts in attitudes toward research methods can be noted:

1. In 1936, 45% considered a knowledge of psychology, "say four semesters of work," to be a necessary qualification for research, as contrasted with 17% in 1988.

2. In 1936, 45% held that methods of research used in chemistry and physics could be applied to industrial arts, as contrasted with 75% in 1988.

3. In 1936, 75% felt that new methods of research must be developed peculiar to industrial arts. In 1988, only 11% were in agreement with this statement.

When Cleeton (1936) gave his report on MVITEC member opinions, he emphasized his personal points of disagreement, especially his distaste for questionnaires, surveys, and bibliographic work except as preliminary devices. He also supported knowledge of statistics and psychology as prerequisites for research. Lewis (1932) had noted that "the questionnaire method has been greatly abused, but is sometimes desirable" (p. 3). Crawford (1928), author of an educational research textbook cited by MVITEC authors, noted that the questionnaire method was controversial in education (p. 177).

In the 1950s, the amount of questionnaire or survey research was considered excessive and experimental research was considered as lacking by Feirer (1951) and Glazener (1956). In 1960, Reed, from what was apparently a survey of the membership, noted that the dominant specific research units in which a master's candidate in industrial arts should be competent were considered to be (in order): experimental, survey, general knowledge, and historical.

There appears to be a historical trend toward methodological homogeneity, accompanied by persistent heterogeneous elements. In the trend towards homogeneity, practical research was and remains an overriding concern. In the process of integrating itself into the framework of educational research, the field accepted externally developed research methods with little serious, systematic reflection on methodological foundations. Perhaps the most significant conclusion from the 1988 replication of the 1936 survey may be not so much the changes in methodologies, but the apparent decrease in internal differences of opinion as indicated by a general, systematic movement away from all 1936 areas of divided opinion (e.g., 50%/50% or 45%/55% ratings).

Heterogeneous elements include differing opinions toward such matters as the appropriateness of physical science research methods for technology education, required knowledge of psychology, and required knowledge of statistics. It is precisely these areas that may indicate the extent of attachment to positivist social science ideology and the lack of reflection on philosophical and methodological foundations.

Research Methods: Prospects for Change

The purpose of this section is to assess research methods in light of the conceptual tools of the first section and the historical analysis of the second section. The fact that research of the period 1960-present is not treated in detail in this study is intentional. This period has been covered in detail by others (e.g., Dyrenfurth & Householder, 1979; Martin, 1979) although research methods were not their central focus. Furthermore, the period 1960-present is well known. Therefore, this section focuses on the present status and future directions in research methods.

Development of Research: Programs, Curricula, Topics

In retrospect, there appear to be three phases in the history of research in American industrial education in the 20th century: (a) establishment of academic programs (1900-late 1930s); (b) curriculum development (late 1940s-1960s); and (c) topical concerns (1970s-1980s). Although the early MVITEC papers cannot be considered as conclusive evidence of industrial education research emphases throughout the United States, they do indicate that an overriding concern was the establishment and design of programs and the content of research, with only an ephemeral reflection on research methods. The second period is widely held to be a period of active curriculum development as confirmed by Martin (1979). The third period, since the late 1960s, is perhaps best illustrated by Dyrenfurth and Householder (1979), whose organization is based on a variety of topics, with no single dominant topic, although curriculum studies are slightly more numerous than those in any other single category.

A general, yet tentative, conclusion of the preceding section on MVITEC member attitudes towards research methods was that there is now more agreement (homogeneity) among members regarding research methods than in 1936, at least regarding the particular methods included in the survey. This homogenizing trend can be interpreted as a sign of stabilization within the field, depending on the degree to which MVITEC is representative of the field. However, there are several fundamental issues that remain unexamined. For example, an increase in agreement on research methods does not indicate the extent to which preferred methods are appropriate for contemporary research, nor does it confirm that appropriate conscious reflection has been carried out to substantiate the preferences. Given the amount of curricular innovation and heterogeneity in recent years, one might anticipate some changes in research methods. On the other hand, increased agreement (stability) on research methodology may serve to counterbalance radical curricular and content changes (instability).

The intent of this section is to examine some aspects of these issues. Despite the need for homogeneity, some heterogeneity is important for growth, alternative research methods need to be considered, and reflection within the field needs to continue. The descriptive dichotomies introduced earlier in this study are not necessarily mutually exclusive characteristics of research methods. For example, a study can be both diachronic and synchronic (e.g., Bennett, 1926, 1937) and both qualitative and quantitative (e.g., Floud, 1979). Hence, the dichotomies should be considered as conceptual, heuristic devices for reflection on important research issues rather than as definitive categories.

Synchronic-Diachronic

Despite the perceived differences between industrial arts as a part of general education and vocational industrial education, both groups have often accepted similar locations in colleges of education and have developed along similar lines of educational research methods and problems. A historian of industrial arts and a historian of vocational industrial education have much in common and simply cannot afford to take a narrow perspective of the field without compromising their ability to understand technological and educational development.

Ideally, researchers need to develop a sense of both the diachronic (e.g., historical change or process) and the synchronic (e.g., structures, quantitative and qualitative analytical systems considered at one point in time). Yet, some emphasis is necessary for achieving depth and detail. The natural scientist or technologist usually emphasizes the synchronic—the conceptual and experimental rigor of the contemporary system. The historian of science or technology usually emphasizes the long, developmental process of changing systems (e.g., Koyre', 1939; Kuhn, 1962). An industrial education researcher of learning styles or curricular development needs to emphasize the conceptual and experimental rigor of contemporary systems of analysis but also needs some sense of the historical changes in student populations or curricula.

Relatively few disciplines have an explicit, diachronic emphasis (history, philology, geology, history of technology, history of science, or genetic epistemology). Most disciplines focus on rigorous synchronic systems. Awareness of changes in other fields helps to understand disciplinary changes in one's own field and possible parallels. For example, the study of language and literature used to have a diachronic emphasis except in the case of systematic rhetoric and grammar. In the 20th century, however, the scientific study of language (linguistics) has developed extensively and has been accompanied by synchronic approaches to literature such as those found in deconstruction, structural, thematic, and psychoanalytic studies (e.g., Barthes, 1970; Lacan, 1966).

Similarly, the synchronic/diachronic distinction is of major importance for technology education, which includes both the study of contemporary technological systems and the historical and changing socio-cultural context. In contrast, the natural sciences emphasize the study of synchronic systems, not the historical development of these systems. A full understanding of technological systems requires an understanding of their development; they are products of the past and retain elements developed in the past. Staudenmaier (1985), for example, made an extensive analysis of the historiography of technology and different methods of analysis. Mitcham and Mackey (1972, 1973), on the other hand, emphasized the synchronic aspects of the philosophy of technology, though not neglecting the importance of diachronic interpretation. Ultimately, excessive emphasis on either the diachronic or synchronic may limit the pursuit of truth by fostering an increasingly narrow disciplinary ideology. In industrial education, Zuga (1985) analyzed ideological changes diachronically, thus illustrating one means of avoiding excessive preoccupation with contemporary ideology.

Subject-Object Structures

A basic understanding of the relationship of the "subject" to the "object" of the study is fundamental to understanding the research process. There have long been two general tendencies in knowledge generation: (a) an emphasis on the role of the subject (e.g., contemporary idealist, medieval realist); and (b) an emphasis on the role of the objects or phenomena (e.g., empiricist, medieval nominalist). Idealists emphasize that knowledge is structured according to the mind of the subject; emphasis is placed on the mental or organizing structures of the human being. On the other hand, realists emphasize the importance of structures considered as inherent in the objects or phenomena examined by the subject.

The implications of this difference in emphasis are important for industrial education. If industrial education is limited to the study of the changes in the form of materials, then researchers will tend to emphasize materials, processes, or systems. On the other hand, in industrial arts, ever since the Bonser and Mossman (1924) definition there has been a professed interest in the "problems of life" related to the changes in the form of materials. In this perspective, the process of knowing involves a reflection back onto the subject (researcher). This emphasis on the subject-object relationship may help to explain some of the differences between industrial arts and vocational industrial education. Vocational industrial education has usually emphasized skill development rather than the subject-object relationship. Technology education has inherited the emphasis of industrial arts; however, the complexity of the field is now greater because of the expansion of the curricular base and the increased need for abstract technological concepts.

The study of technology is complex because of the wide range of research methods and problems, which involve technological objects and practices as well as knowledge structures and processes. This complexity is further increased, however, when one begins to reflect on the relationships between the subject and its object, as in the work of Heidegger (1962, 1977). The study of technology has become much more than a simple study of the nature, principles, and laws of materials, processes, and their physical transformation. Traditional educational research methods cannot handle the complexity of the study of technology and technology education because their parameters do not permit adequate reflection on the full breadth of the problem.

Ethnographic methods (e.g., Spindler, 1970; Edgerton & Langness, 1974; Georges & Jones, 1980; Bogdan & Biklen, 1982) are more likely to provide a broader view of innovative programs in industrial education because they include descriptions of the overall context (e.g., Passmore, 1982; Zuga, 1987). In studying traditional industrial arts programs, narrow, detailed studies can be conducted without losing sight of the overall context, because the context is familiar. This same familiarity can, however, perpetuate current ideologies and prevent fundamental epistemological reflection on underlying assumptions.

The structural anthropological approach of Levi-Strauss (1958) may also be appropriate to the study of technology because of the emphasis on the commonalities of structural organization among societies. Since technology is a very intentionally organized activity or system of knowledge, it strongly reflects the relationship of the structure of human thought to the transformation of materials as well as the intentions and values of humans.

Other methodological options that have not yet received much attention in industrial education are the so-called "critical theory" and "praxis-oriented" approaches to research (e.g., Lather, 1986). The emphasis is on the relationship between the subject and object with the explicit goal of modifying this relationship during the research process. The "emancipatory" emphasis found frequently in technology education appears to be quite compatible with such a method and deserves further attention.

Qualitative-Quantitative

The two terms "quantitative" and "qualitative" have become especially problematic because of multiple usages, contexts, and perceptions (e.g., Smith, 1983; Howe, 1985; Smith & Heshusius, 1986; Miller, 1986). Although this debate in education has important implications for industrial education (especially technology education), it is not the intent of this study to address the debate itself but rather to clarify the two distinct emphases. An illustration of the distinct, but complementary use of the two terms is found in chemical analysis: "qualitative analysis" to refer to the determination of constituent elements or compounds; and "quantitative analysis" to refer to the amounts or quantities of various elements or compounds. However, since this example is drawn from the natural sciences, it does not emphasize the epistemological reflection on the subject that the term "qualitative" research often implies.

Passmore (1987) criticized the excessive preoccupation with quantification, emphasizing that objectivity, precision, and empiricism are the guiding principles in research. Quantitative analysis, though important, has often been emphasized out of proportion with qualitative aspects such as research conceptualization, including the relationships and intentions between the researcher (subject) and object, relative significance and interpretation of findings in a historical and social context, and ideological frameworks in which the research problems and methods were conceived. Statistical analysis is essentially synchronic and is limited to the extent that it does not reflect on itself or on its ideological assumptions.

Different fields experience different levels of qualitative and quantitative integration or segregation at different points in their own development as fields. For example, ethnographic research methods have been adapted to the analysis of educational contexts but have often been labeled as "qualitative." However, there is no reason why ethnographic methods cannot use quantitative analysis; indeed, Edgerton and Langness (1974), in their presentation of methods for the study of culture, included sampling, data analysis, and statistical tests of significance. Quantitative analysis in historical research has received considerable attention in the last 25 years. Davis and Engerman (1987) presented a concise summary of cliometric research, which should be of particular interest to technology education because of its emphasis on economics and relationships to technology. One of the most succinct introductions to quantitative analysis in the field of history can be found in Floud (1979), who presented a relatively balanced approach to integrating qualitative and quantitative aspects in history.

Summary

Due to the breadth of interdisciplinary subject matter in industrial education and the position of industrial education within the academic structure, different methods are appropriate for research in industrial education. Three characteristics of research methods were examined: (a) synchronic-diachronic; (b) subject-object structures; and (c) qualitative-quantitative. A survey taken from MVITEC archives contributed to the examination of early research methods and permitted a comparison of attitudes towards methods in 1935-36 and 1988. The third section focused on more recent developments in industrial education research methods, including alternate epistemological and methodological options for the field.

Several implications can be drawn from this study. The field needs to reflect more consciously on its methodological heritage and the relationship of evolving subject matter to the means of doing research. There is some evidence of increased homogeneity in terms of preferred research methods among MVITEC active members; however, additional research would be required to confirm this homogenizing trend for the field as a whole. Furthermore, it is not clear whether the field is achieving greater maturity or stability in terms of methodology or simply whether a more pronounced, yet unexamined ideology is becoming established. In either case, a moderate amount of conscious heterogeneity in research methods could be a valuable stimulant to the growth of the field, resulting in increased interdisciplinary contacts. Since so much of the research in the field is done at the graduate level, graduate programs need to provide adequate training in research methodology. The radical changes in curricular content and breadth, especially in technology education, require an equivalent level of methodological development to maintain a balanced research environment.

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TEACHING SOCIAL VALUES OF WORK IN INDUSTRIAL EDUCATION [1]

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Teaching the elements of work is not strange to industrial educators, whether they are preparing their students for entrance into the workplace, teaching them about industry as part of their general education, or helping them learn about human adaptive systems as a study of technology. In all of these instances, the content of instruction is often drawn from the workplace, especially the industrial workplace. Learning activities used in industrial education, whether in the form of exercises or projects, are often derived or taken directly from functions performed by workers. These are taught in an atmosphere where the work values of planning, conservation, thrift, and diligence are rewarded; carelessness, slothfulness, and waste receive disapproval. The teachers of industrial education are usually steeped in the values of the workplace and hold work as a central part of their lives. Of all the subject fields taught in schools in the United States, industrial education, in all its forms, is one of the major contributors to teaching for and about work.

Work is conscious effort for the purpose of producing benefits for oneself or for oneself and others. Over the history of the United States, work has changed sufficiently so that some of what has been taught about work in the past may no longer apply. Some have noted that there is not as much "good" work as there used to be. The declining percentage of jobs in the goods-producing sector of the economy, the de-skilling of many jobs, and reduced numbers of those who perform full-time work in the home are cited as evidence of this change. The workplace is different from what it has been and the change is not seen as an improvement by all observers.

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Beyond this, those who are entering the workforce differ from those who have completed their work careers and are now leaving. As a group, the new workers of today have completed more years of education than workers at any other time in the United States. They are also more often female and increasing percentages are black, Hispanic, or of another minority group. At the other end of the spectrum, the number of retired individuals in our society has increased. Retirees have a vast potential for continuing to work, though they often donate their efforts in volunteer service.

This paper is a study of the concept of work undertaken to increase understanding of the implications of teaching about work in industrial education. In the first part of this study, societal work values in the United States are identified through a chronological examination of the time from the colonial period through World War II. This is followed by consideration of these values in the context of today's work. On this basis, suggestions are made for teaching about work in industrial education.

Societal Work Values

There are three major sets of societal values about work that have been identified through this investigation. These are: spirituality and success; thrift and consumption; and, individualism and social consciousness. The terms used to describe these sets of values represent widely separated, if not opposite, qualities associated with work. They describe dimensions of work values that have changed over time. These values have been intertwined with each other as they have evolved. They are identified at this point to assist the reader in tracing their development to the present time.

Today's ideas about work in the United States predate the present generation of workers. Many of the concepts are rooted in Europe and other parts of the world and readily traceable to the time of Christ. Identification of these traditional societal ideas about work and their sources can help in understanding the complexity of present work values.

This section is divided approximately at the time of the Great Depression, an era that brought major changes in the disposition of the people of the United States; the individualism of the 19th century was no longer sufficient to deal with the social problems of the day, and citizens did not stand alone in the complex society that they had created (Howard, 1960; Wallace, 1933).

Before the 1930s

Early New England values about work were dominated by the ideals of the Puritans. Their work ethic was held throughout the colonies, with only minor variations from the Puritan model.

The Puritans traced their practices and teaching to the Protestant reformers, Calvin and Luther, whose interpretations about work were based on the apostle Paul and other scriptural writers. Calvin and Luther believed that all work was equally worthy in the eyes of God and that work was a gift of God (Calvin, 1851; Luther, n.d.). According to Calvin and Luther, vocations within the church were no better than any other work, contrary to what had been taught before the reformation. Work was not dichotomized as either sacred or secular. All honest work was honored by God (Billing, n.d.). Following the logic of Calvin and Luther, each person should be thankful for the work given by God and should strive to perform it faithfully. For the Puritans, work was a form of worship. They extended the interpretation of Calvin and Luther to include the principle that God rewarded those who worked industriously. An individual's prosperity was considered to be evidence of God's blessing (Wertenbaker, 1947).

Like the Puritans, there were other immigrants who brought their values about work to the New World. German and Russian Jews settled in tiny Spanish and Portuguese colonies in the 17th and 18th centuries (Degler, 1959). They viewed work as one of the primary functions of humans, "to create, carrying on from where the Creator himself left off at Genesis" (Meiseles, 1964, p. 357).

Another 35 million newcomers came to the United States in the century after 1820 (Handlin, 1951), a century that included severe economic depressions with lack of employment, child labor, and starvation. In many ways, these people reinforced the work ethic of the Puritans, but they also brought a more diverse perspective. At first, these groups were comprised primarily of immigrants from predominantly Protestant northern and western Europe. After 1896, the majority groups were southern and eastern Europeans, who were more often Catholic (Degler, 1959). They came with beliefs, such as those of St. Jerome, that the worker should be self-supporting, able to give to the needy, and that work should help to form a life of holiness. St. Augustine wrote, "by his work man helps in carrying out the design of the Creator" (Kaiser, 1966, p. 110).

The prosperity of New England during the late 17th and 18th centuries put pressure on the Puritans and their ideal of work as service to allow for greater fulfillment of self. The result was the religious sanction of the accumulation of wealth. The possession of wealth by means of industry, frugality, perseverance, and sobriety was acceptable. Poverty, on the other hand, was frequently ascribed to a lack of capacity, insanity, prodigality, pride, idleness, and above all, to intemperance (Almen, 1963). Though this shift in values was welcomed by some, it was lamented by others.

One of the factors in this prosperity was the sustaining environment. The wilderness was there to be tamed and the hard work of domesticating it was rewarded.

> From the beginning each colony had its frontier, its West: areas in which men of courage and vigor won new opportunities, where land was cheap or free and the struggle for existence, although severe, brought rewards commensurate with the effort expended. (Tyler, 1944, p. 15)

There was an equality of condition on the frontier in which "station, education, refinement, and even wealth mattered little" (Tyler, 1944, p. 18). Everyone faced perils and grueling work. "The weaklings moved on, dropped back, or died of their failures, while the vigorous and self-reliant remained to become the leaders and the models of frontier achievement" (Tyler, 1944, p. 18). This creed of work and frontier individualism was followed so zealously that it came to color the activities of the whole United States.

Individuals from Benjamin Franklin to Henry Ford were influential in teaching self-reliance in their ethic of work. They professed a belief in a "Manifest Destiny," wherein hard work and careful living were the means of achieving the national destiny made possible by the natural resources of the continent. The attainment of personal potential was an integral part of this nationalistic ideal. Many success stories appeared in the popular literature from 1865 to 1915, including those featuring Andrew Carnegie, Marshall Field, J. P. Morgan, John D. Rockefeller, James J. Hill, Theodore Roosevelt, and Thomas Edison (Almen, 1963). Orators and writers spread the word about the work ethic from books, pulpits, and podiums. Henry Ford is credited with saying, "work is our sanity, our self-respect, our salvation" (Ford, n.d., p. 73). William Holmes McGuffey, a Presbyterian minister, included stories of the rewards of work in his *McGuffey Reader* series. Russell H. Conwell, a Baptist preacher, is said to have given his "Acres of Diamonds" address to eight million people. In it, he professed that great wealth was within the reach of almost everyone and that it was their duty to get wealthy. More good could be done with wealth than without it (Almen, 1963).

The era between the Civil War and 1915 was one of unprecedented national growth. Industry was flourishing in its newfound productivity. There was a rapid increase in the number of millionaires. The principle of developing wealth was supported by industrialists, politicians, and the clergy, and there was, to some extent, an alliance among those groups. Theodore Roosevelt wrote, "God does not accept half-hearted work. His servants must throw their whole souls into service they render him, if they would count" (Rouff, 1903, p. 44). Success was identified with fame, still more with power, but most of all with wealth. Economy and thrift were important, but they needed to be coupled with hard work (Almen, 1963).

The productivity of industry gave a hint of the possibility that abundance could be attained by all people, although there was some skepticism about that idea. Many people had become very wealthy, but this wealth had not extended to the middle class. Many believed that factories did not provide desirable work. According to the 1890 and 1900 censuses, the number of menial jobs in industry had increased at a more rapid rate than had executive positions.

While the Gross National Product had increased dramatically, wages had gone down. It was argued that low wages were responsible for continuing child labor and the employment of large numbers of women. Slum living, vice, and corruption were attributed to low wages in factory cities. Social scientists joined with religious leaders as advocates for the disinherited factory worker often caught in city slums. Abell (1943) wrote about the middle class creed which expressed common beliefs about work and its rewards:

1. Workers should be provided with economic security and

satisfactory working conditions.

2. There are limits on the average person's ability to acquire wealth.

3. There are questions about the morality of individuals who have great wealth.

4. There is more reward in service to humanity than in gaining wealth.

After World War I and through the 1920s, the high production capacity of industry drew attention to the need for increased consumption of consumer products. If the output of industry were to be sustained, it would be necessary to consume the increasing number of goods that were produced to make life easier. Among these consumer products were automobiles, refrigerators, radios, and many other appliances. The work of the farmer was made less toilsome by new machines that increased the productivity of the farm. It was difficult for people who believed that successful work required diligence, conservation, thrift, and sobriety to accept their new "responsibility" to consume.

1930 and Later

The Great Depression was not a single event; it was a sequence of many events that affected people in many different ways. It did not happen in the United States alone, but was a major economic and social occurrence in the capitalist societies of the world. In many ways, the crash of the stock market in October, 1929, signaled the beginning of the depression in the United States, though that event is probably overstated as the cause of the Great Depression.

The decade of the 1930s was dominated by a depression economy that was "paradoxically able to accomplish miracles of production at the same time as it left millions unemployed, ill-fed, ill-clothed, and ill-housed" (Almen, 1963, p. 178). It brought about great changes in thinking about work in the United States. According to Howard (1960):

> The most radical effect of the economic depression upon the American consciousness was to make the old attitude of *laissez-faire* impossible. .... People were forced into an awareness that individuals did not stand alone in the complex society that they had

created. (p. 297)

Henry Wallace, an agriculturist and editor who later became Vice President of the United States, wrote in 1933 that "the individualism of the nineteenth century was not sufficient to provide effective insight into the social problems of a world which had suddenly become filled up and drawn together" (p. 9). Self-sufficiency through work was not a realistic incentive for most individuals. No amount of hard work could change the economic and social forces over which the individual had no control, despite the effect of those forces upon personal well-being. For many, hours of work were long, pay was low, and there were slums in many cities. Even though they followed the 19th century work ethic practice of diligence, many were left destitute. The need for social conscience exceeded the need for dedication to work.

With the increasing efficiency of mass production, industry could produce more than customarily had been consumed. The principle of thrift in work no longer fit. Only about one-third of the labor force in the United States was engaged in agriculture, and there had been major shifts from the production of goods to the provision of services. To some, the cause of the Great Depression was the lack of consumption. More consumption was needed to provide the fuel required to keep industry producing at its capacity. An underutilized industrial capacity could not provide the benefits of jobs and prosperity if its products were not consumed. Ginzberg (1982) stated that "national policy began to look at employment as much from concern to ensure the consumption of goods as from concern to secure their production" (p. 67). Chase (1934) defined this as the "age of abundance" and included these points about work in his definition:

1. There was a geometrically increasing curve of invention.
2. Bulk work was assumed by inanimate energy.
3. Consumption was a greater problem than production.
4. There was a reduced need for capital outlay by workers.
5. Self-sufficiency was destroyed through specialization.

With the age of abundance came the opportunity for leisure. The prospect of leisure for everyone severely threatened the existing work ethic. Work for work's sake was no longer justifiable. Widdrington (n.d.) wrote, "work is not an end, but at best a means to an end. Work is one of the constituent parts of a man's life, but no more so than play, or art, or worship" (p. 131). An editorial in the *Christian Century* (1935) lamented that industriousness, honesty, benevolence, and thrift, virtues characteristic of capitalism, had become suspect, and that the moral fabric of the West was corrupted. The meaning of work had changed. There was a renewed call for social consciousness as it was recognized that more than individualism, diligence, and thrift in work was required.

While there was a new emphasis given to the meaning of work during the depression, there were massive efforts by the federal government to provide work for more people. The Franklin Roosevelt administration introduced the New Deal and its objectives: relief, recovery, and reform. Jobs were created and funded through the federal government to provide services for the public benefit through such employment programs as the Works Progress Administration, Public Works Administration, Civilian Conservation Corps, Federal Arts Project, and National Youth Administration. The number of those on relief had swelled to 18 million individuals in May, 1935 (Quarles, 1987).

Other acts of the federal government directly addressed many long-standing conditions of work. The National Industrial Recovery Act (1933) provided for the establishment of codes that determined minimum wages and the maximum length of the work week. The National Labor Relations Act of 1935 (the Wagner Act) guaranteed the right of collective bargaining and restricted company unions.

The Social Security Act (1935) provided income for disabled and retired workers, while the Unemployment Compensation Act (1935) assisted those who were unable to find work. The cooperative federal-state administration of these laws further solidified the concept of shared responsibilities within a community of citizens.

During the years of World War II, the principles of social consciousness and shared responsibility were extended to address another area of inequity in work: racial prejudice. Although this was not the first effort in this area, the crisis of wartime created an atmosphere that made it important to solve some of the problems of differential treatment in the workplace. Franklin Roosevelt, credited with many of the economic gains accomplished by blacks in the 1930s, had won 70% to 80% of their votes in the presidential elections of 1936 and 1940. His administration had opposed racial discrimination in principle (Quarles, 1987). However, in spite of an antibias clause, blacks were not proportionately represented in defense industries and in the vocational training programs operated under the National Defense Training Act (1940).

Frustrated with the pace at which corrections were being made, A. Philip Randolph, President of the Brotherhood of Sleeping Car Porters, threatened a march of 100,000 blacks on Washington. Faced with this possible embarrassment, Roosevelt signed an executive order to reaffirm the intention that the defense industry provide employment opportunities for all workers. This also opened the way for blacks to enter federal employment, and the percentage of blacks holding government jobs in Washington rose from 8.5% in 1938 to 17% in 1942 (Quarles, 1987). In these ways, the federal government added to the strength of the idea that individuals do not control fully the outcomes of their own work and that intervention may be needed to bring justice into the workplace.

After the end of World War II, international conflicts continued. The defense industry of the United States was not dismantled as it had been after earlier wars. Consumerism picked up where it had left off before the war, intensified by access to easier credit for major purchases, such as homes and automobiles. Guaranteed home loans, funded through the G. I. Bill of Rights (1944), became available to those who had served in the Armed Forces. Home loans for other citizens were insured by the Federal Housing Administration (FHA) which had been created in 1934. The FHA program reduced the required down payment for a home, while lengthening the repayment period for the loan. The earlier practice of lump sum repayment of mortgage was, in effect, ended. Increasingly, ownership of a single family home was promoted as the standard for the post-war family. The infusion of government money into the defense industry continued to change the nature of work for many people. Easier credit made it expedient to borrow as a means of attaining a higher standard of living in a consumer-driven economy (Ginzberg, 1982).

Conclusions

From the preceding chronology of events about work in the United States, it is possible to identify some primary social values associated with work. The historic examination of these values makes it possible to understand better their original meanings and to consider present practices against that backdrop. This review sets the stage for the study of contemporary work which follows these conclusions.

Spirituality and success. The distinction between work that is sacred and work that is secular had been set aside, thanks in large part to Luther and Calvin. However, it was difficult to claim equality of work when socio-economic status clearly related to the strata of occupations. Menial industrial jobs increased in number more rapidly than did executive jobs, a trend which was criticized in the early 20th century. Churches joined with social scientists to come to the aid of the disinherited factory worker. There were great differentials in the rewards for work as the number of millionaires increased and manual workers' wages decreased. Workers, who at one time may have felt that their work was less worthy because it was secular, were given that assessment for reasons that were not as clearly articulated and may have seemed less logical.

Expressions of the spirituality of work are evident in many religious traditions. Jews, Catholics, and Protestants all brought religious concepts about work with them to the United States. But, the holders of religious ideals have been willing to change their work ethic in order to adapt to developing conditions. An early example of this was the effect of New England prosperity on the work ethic of the Puritans. Later, as the productivity of industry made easier living accessible to more people, the concept of work for work's sake was no longer justifiable. Political, industrial, and religious leaders became advocates of success as measured by wealth, thereby reducing earlier emphases upon such values as the continuation of creation through work and work as a means of communing with a divine being. At the same time, the social consciousness that resulted in resistance to low pay, long work hours, child labor, and city slums, was partially rooted in religious beliefs and practices.

There have been ambivalent and conflicting ideas about the acquisition of wealth. At times, wealth building has had religious sanction. Wealthy people, including Andrew Carnegie, John D. Rockefeller, J. Paul Getty, and Donald Trump, have been admired and praised for their success. But questions remain, and are often raised by the middle class, whose creed encourages them to doubt the morality of those with great wealth. These conflicting trends suggest that religious work values are no longer basic to many who advocate them and presumably practice them as other values, including those related to the standard of living and other criteria for success, gain dominance.

Thrift and consumption. With the growing strength of industry in the early 20th century, consumption became the dominant force related to work values. The passing of what the *Christian Century* (1935) called the capitalist ideals of industriousness, honesty, benevolence, and thrift was lamented. Consumer purchasing had become a means for creating work, while the desire for consumer goods was a primary motivation for working. The rewards of consumption were not reserved exclusively for those who had saved enough from the production of their work to afford the purchases. Easier credit, available to a large portion of the adult population, gave value equivalent to earnings. Consumer buying was carefully watched as one indicator of the health of the economy. The asset requirements to qualify for major loans were reduced. Consumption became an important motivation in the United States, and its proponents stressed that in an economy of abundance it was justifiable to borrow against tomorrow's productivity.

Individualism and social consciousness. The individualism that purportedly brought success on the frontier became the model for individualism in work across the United States. Additionally, the admonition of the wealthy, who were prototypes of success, was that the only barrier to matching their achievements was lack of effort. These ideals clearly placed success in the hands of the individual. The Great Depression changed that. It demonstrated that individuals could not control their own well being and that hard work was not always rewarded economically. There were poorly understood forces over which individuals had no control that had a greater effect on the outcomes of work than any variation in the effort of the worker.

Contemporary Work

The work values of spirituality and success, thrift and consumption, individualism, and social consciousness apply to contemporary work even though they may be easily hidden by the rapid rate of the changes in work. In this section, two primary work variables will be examined: the workplace and the worker.

The Workplace

A major change in work today is the shift in the number of jobs from goods producing industries to service producing industries. The Bureau of Labor Statistics (BLS) estimated in 1986 that about 70% of all jobs in the United States were in industries that provide services, such as health care, trade, education, repair and maintenance, government, transportation, banking, and insurance. Industries that produce goods through farming, construction, mining, and manufacturing accounted for about 30% of the country's jobs. "Between 1940 and 1980 employment in service occupations grew from 46% to 68% of total employment. Of all new jobs added to the economy from 1969 to 1976, 90% were in services" (Ginzberg, 1982, p. 71). Some economists have argued that work that does not result in a physical output is not productive, while others have countered that the value added through services performed is an output of work. In estimating the value of service work, the physical products of such services as transportation, electric power utilities, and repair and maintenance should also be taken into account (Ginzberg, 1982). This model of work is far removed from the self-sufficiency and thrift practiced by the Puritans and much more in harmony with the consumption standard of the post depression era.

Much is made of the impact of technology on work. Early machines took the place of human and animal power. Today, machines perform the functions of the human nervous system. This applies to the workplace whether it be in an office, factory, school, home, church, marketplace, or elsewhere. This technology included many forms of mechanization, but there are other technological systems devised to solve problems that are not equipment based. These include systems as diverse as organization plans, statistical sampling procedures, and quality teams. But, the impact of technology on work is not primarily in the creation of new jobs. Levin and Rumberger (1983) stated that high technology would account for only about 7% of all new job openings during the period from 1980 to 1990. More job openings during this period would result from the need for replacements than from new jobs. Jobs with a large employment base, such as janitor, nurses' aide, sales clerk, cashier, and waiter and waitress would demand larger numbers of workers (Bureau of Labor Statistics [BLS], 1984).

The presence of such physical technologies as computers, lasers, robots, and remote controls in offices, factories, and homes gives evidence of the changes that technology has brought to the workplace. These and other technological artifacts are offered as means of making work more productive, less hazardous, more convenient, and more accurate. The growth of technology is supported on these grounds, and it is argued that any expanded productivity will be met by increased consumption.

The United States is in a world economy to a greater extent than it has ever been before. The products of work are beamed back and forth between continents by satellite, many cities have built world trade centers, raw materials from one country are processed in another country and finished products returned for sale in the country of origin, and the international balance of trade has become a monthly front page news item. Carnevale (1983) states that there is a rationalization of the world economy in which highly skilled, advanced technology production concentrates in developed nations, while low skilled jobs using lower levels of technology concentrate in lesser developed countries. In this rationalization, the location of jobs is shifted because of factors such as the cost of labor, location of resources, corporation taxes, and environmental controls. Types of work will be relocated, as we have seen with clothing manufacturing, steel making, and automobile production, thereby altering the work that is performed in a given place.

Unionized workers in the United States have successfully advocated the equalization of work-derived benefits within a specific craft, enterprise, or industry. It is much more complex to accomplish similar equalization of benefits around the world. Workers throughout the world are faced with issues of the value of their work in a world-wide context. An increasingly mechanized world community must face the problem of income distribution (Leontief, 1982). The United States ethic of work that honors the collective welfare of workers will be faced with new challenges, particularly as workers in less advantaged nations act to improve their comparative positions.

A primary determinant of the response to income distribution is the view held about the world's material resources. One view is that the resources are there to be used in the manner of "manifest destiny" as practiced in the United States. Another view is that there are finite resources in the world and that their expanded use will prematurely exhaust them and perhaps destroy the environment in the process. Under the first view, there are new resources that can be added to the benefit of workers who are presently in a disadvantaged position. Advantaged workers may not need to give up anything in this vision. But, if there are definable limits to the world's resources, any gains by less advantaged workers will come at the expense of advantaged workers. This redistribution may be in the form of earnings, but it may be in such changes as the proportion of income that has to be spent for food and housing, protection from unemployment, and flexible scheduling of work time.

Another of the variables affecting the concept of work is the ideal of full employment. According to Leontief (1982), proponents of full employment who thought the 1945 unemployment rate of 2% was irreducible had revised their estimates to 4% by the 1960s. A full employment economy was the goal set by the Employment Act of 1946 and revived in the Humphrey-Hawkins Act of 1978, which included goals of an overall unemployment rate of 4% with an inflation rate of 3% by 1983. This legislation established a high priority for the elimination of unemployment of those applicants who were able and willing to work. Though the legislation was passed, it was considered to be unrealistic at that time and policies were not put into effect to bring it to realization (Pianin, 1979).

Carnevale (1984) explains that policies of the United States government have been used to try to set an acceptable balance between unemployment and inflation. Over the years, a tolerable inflation rate has gradually pushed the unemployment rate accepted as full employment to higher levels. Because inflation is politically less acceptable than unemployment, the unemployment rate will probably fluctuate as a result of controls exercised on inflation (Carnevale, 1984). All of this becomes more complex in the context of a world economy. There are many political entities that are trying to control inflation and unemployment. If further mechanization in the workplace reduces the number of worker hours required to produce the goods and services consumed, means will have to be devised to determine who will work and how much. Even in this atmosphere, many may believe that work is a necessary part of personal fulfillment. In that case, the concept of fulfillment through work outside of employment needs to be strengthened, the stigma associated with unemployment needs to be reduced, and public policy needs to consider creating jobs or supporting a corps of unemployed workers.

Workers

The labor force in the United States is larger, younger, and has more females and minority group members than ever before. These factors in themselves have had an impact on the concept of work. For example, the division of work between women and men in the home and in paid employment is very different from what it was in the past. It is now more generally acceptable and more often expected that women will work outside of the home and that men will share in the work of the home.

In the 15-year period from 1982 to 1997, the labor force in the United States is projected to grow from 110 million to 131 million people. Much of this growth will result from the increasing population size, but the overall employment-to-population ratio is higher than it has ever been (Levitan, 1987). The rate of growth of the labor force is slower than it was during the 1960s and 1970s (BLS, 1986). About two-thirds of the labor force growth will be due to women who seek jobs. This is related to the increasing educational attainment of women and the fact that about 20% of all households with children under 18 years of age were headed by a woman in 1985 (Levitan, 1987). The proportion of blacks and Hispanics in the labor force will continue to increase, too.

By 1990, close to one-half of the labor force will be between the ages of 25 and 40. This group will number 65 million in 1990, compared to 40 million in 1975 (Carnevale, 1984). Through the mid-1990s the number of 16- to 24-year-old workers will decline (BLS, 1986). This is already evident in that traditional employers of young workers, such as fast food restaurants, are seeking retired persons and other older workers to fill their ranks of employees. Levitan (1987) predicted that early retirement will become increasingly unattainable and that older workers will stay in the labor force longer. This will be encouraged by such factors as the high cost of pensions and the taxing of Social Security benefits.

The level of educational attainment of the labor force has continued to rise. About one-half of all 25- to 34-year-old workers have at least one year of college. During the 1960s, 90% of all college graduates found jobs in managerial, professional, or administrative occupations (Levitan, 1987). From 1970 to 1984, about 20% of college graduates took jobs not usually requiring a college degree (BLS, 1986). With the increased educational level of workers and more fully mechanized work, many workers will need to invest less of themselves in their jobs, giving them opportunities in the workplace for more activities unrelated to their jobs. Not all of these activities are productive; they may include daydreaming, talking, playing games, gambling, and diverting supervisory control. They may also be dissatisfied with their limited participation in decisions about their work and frustrated by the managers who they see fail to perform effectively (Ginzberg, 1982).

Teaching About Work

There is more to be taught about work than the particular tasks that are included in a job. Perhaps the greatest lessons are that work and job are not synonymous terms and that all industrial educators are preparing learners for work. The settings for work are as varied as the places that humans inhabit. People in the industrialized nations of the world have their work in factories, farms, businesses, homes, and community organizations. Those who live in subsistent cultures have their versions of these same organizations which provide the sites for their work. Conscious effort to produce gain for oneself or for oneself and others occurs in many places and for many specific purposes. The work of people takes many forms and is performed for many reasons wherever they are located. But, even understanding this, there are several important lessons about work to be taught by industrial educators. Based on the examination of historic societal work values and contemporary work, this concluding section offers recommendations for teaching about work.

Purposes

Work can be studied and taught in a detached, clinical way. In many cases, this may be the appropriate approach. However, work is at the core of the subject matter of industrial education and members of the field can be expected to show some ardor for what they teach about work. Of the many reasons for scholarship and teaching about work, particularly the social values of work, industrial educators should give consideration to these:

1. Knowing about the evolution of the social values associated with work provides a context for understanding the present conditions of work.

2. Knowledge of the social values of work can help workers to understand better the purposes of the work in which they are engaged and to gain better control of it.

3. As contemporary work is examined against the backdrop of the history of social values, industrial educators should alert those that they teach about the present conditions of work.

4. After weighing current issues about work and recognizing faults in the conditions of work, industrial educators should become advocates for the correction of injustices in work, whether they are against organizations or against individuals.

To proceed with the task outlined above, it is necessary to employ tools of analysis that will reveal the conditions of work beyond the ways in which it is performed. The analysis and organization of social values as presented here are significant to the contemporary practice of work, but another analysis could yield other major organizers. This is encouraged. In some ways, only a hint of our social understanding of work has been presented here. What follows suggests one of several means for analyzing work and provides some ideas of what can be taught about work using spirituality and success, thrift and consumption, and individualism and social responsibility as organizers.

Analyzing Work

Industrial educators have analysis tools that are well fitted for identifying job skills. Trade and job analysis and its successors have been effective ways of identifying the tasks that need to be taught in preparation for entry into an occupation. These same analysis tools do not identify those dimensions of work that are outside the tasks of the occupation. Although there are social values associated with work, they have not been well analyzed for purposes of teaching about them. Even though these concepts may be more important than the skills of the job in preparing for work today, they are not clearly identified or organized for teaching. Industrial educators need to use some other analysis tools for these purposes.

Swanson and Gradous (1986) suggested a technique for subject matter analysis which is akin to analysis techniques that are familiar to industrial educators and which can be applied to the subject of work. Two paths are followed in this method of analysis: one is behavioral and the other is based upon the literature. The behavioral path uses interviews, consultations, questionnaires, and other means of observing behavior. The second path involves searches and analyses of the literature of the field. The two paths meet in the synthesis step, which is then followed by the description of the subject matter. Several synthesis models are described to aid in organizing the information gathered. These include reflection, matrices, flowcharts, events networks, dichotomies, argumentation, and graphic modeling. The most appropriate synthesis model in a specific situation is dependent upon the preferences of the individual and the characteristics of the specific subject matter that is being analyzed.

Spirituality and success. There has always been some sense of how work is an intrinsic part of what we are as persons. Some of this feeling may have diminished as we have developed a collective concern for the outcomes of individual effort, but many still identify themselves by their work. If employment requires a smaller proportion of a person's time, is less satisfying, seems less spiritually uplifting, or does not provide a desirable identity, a broader concept of work may help to fill the resulting gap. Industrial educators have been effective in teaching the performance of work tasks, which have been taken most often from industry, but they can also teach concepts of work that include parenting, volunteer efforts, community participation, and home maintenance and beautification. They can teach that work may be unrelated to employment, but may follow individual interests, such as earth science, music, history, or wood carving.

Much of the meaning attached to work has to do with human values. With or without intention, people often express who they are through their work and they view their work as a purposeful way of improving their own well-being and the welfare of others. Having a concept of the origins of those values and how they have been developed can make work more understandable. Rather than having to accept someone else's work values for concepts such as success, individuals are in a better position to form their own values if they are cognizant of how those values are derived. Better information about work provides a basis for beginning to question the values that may seem to be the norm.

Thrift and consumption. The historic lesson of the place of thrift in work provides a sharp contrast to the economy of consumption of which work is a part today. Industrial educators can help learners realize the extent to which they are involved in a consumption economy and to respond according to their own values. This economy tries to increase consumption through advertising and the ready availability of credit, but it can create work as the products of each new level of technology in the workplace are consumed.

Fears of the replacement of large numbers of workers with robots was preceded by similar fears as the result of the computer in the workplace. Factory automation had an effect like this, as did mass production, steam power, and perhaps the use of animal power before that. While history suggests that consumption will match the increases in productive capacity, each new generation of technological efficiency has changed the nature of work and has required adjustments.

It should also be understood that the problems are, in part, those that are defined by the people. Not being able to work for 40 hours a week is not a problem, in itself, unless people want it to be one. If 40 or more hours of work per week is not available, but is required for one to earn enough to live, there is a problem with the system for distributing the resources generated by the economy. Solving the problems of thrift and consumption in work first requires that the correct problems be identified. Instruction in this process can be provided by industrial educators through example, description, and guided experience.

Individualism and social responsibility. The work ethic of today is a mix of ideals, which, in some instances, are in direct conflict with each other. For example, advocates of individualism want the protection of the social systems that can be made possible only by collective effort. Over the years, there have been many interventions to try to bring justice to work and workers. Laws to provide more equal access to work are examples of interventions to make the workplace more just. The labor movement grew rapidly in the period following the passage of the National Labor Relations Act (1935), but in recent years that movement has declined as public sympathies, court actions, and economics have favored employers. These actions and those by the government have had an effect on the way in which individuals have thought about their work. They also have been expressions of changing beliefs about the place of work in individual lives. As there are more and more complex challenges about work, it remains to be seen how inventive government will be and how far it will choose to carry its power on behalf of work, workers, and the organizations in which they operate.

Concepts of work in the United States have been influenced by what the neighbors have thought. The Puritans had difficulty maintaining the purity of their ideals in the prosperity of New England. The individualism of the Western frontier became a code of work that was carried back to the Eastern cities and the rest of the United States. As there is a greater sense of living in a world community, there are now new neighbors to influence us and for us to influence. The post-war industriousness of the West Germans has been held up as a standard for U.S. productivity and the management skills of the Japanese have been proposed for emulation. Industrial educators can use these and other examples of how work in the United States is influenced by the world community.

Some would use the systems for providing relief, both government sponsored and charitable, as levers to get prospective clients to change their assumed bad habits that have brought on the need for assistance. These reformers quickly neutralize the economic inequalities of compensation for work and forget the fact that many workers are rewarded less generously than their peers of equal capabilities. This may be situational, but often it is because they differ in gender or skin color. Many of those who are students in industrial education will experience and witness the problems of unemployment and underemployment. There are lessons of self-determination that need to be taught, but there are also lessons of interdependence and mutual concern.

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RATIONALE, BASIC ASSUMPTIONS, AND CONTENT OF INDUSTRIAL ARTS EDUCATION, INDUSTRIAL TECHNOLOGY EDUCATION, AND TECHNOLOGY EDUCATION

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Many hours of informal discussion and numerous formal presentations have addressed the topics of industrial arts education, industrial technology education, and technology education at the sessions of the Mississippi Valley Industrial Teacher Education Conference. Some presentations and discussions clarified the situation, while others inadvertently confused the listeners and participants, and still others incited strong disagreement among the group. This paper attempts to review the rationale, basic assumptions, and content related to each of these fields and to synthesize the relationships between these programs and liberal education. Definitions will be reviewed, lineages will be traced, commonalities will be noted, unique features will be discussed, and conclusions will be presented.

Clarification of Terminology

Liberal or General Education

General or liberal education has many definitions. A generally acceptable expression might be "those knowledges, skills, attitudes, and values that every student needs for productive citizenship into the 21st century." According to Stephens,

> among the things implied by productive citizenship, in addition to occupational competence, are a well developed value system compatible with the workings of society, a sense of responsibility to humankind, the ability to make decisions tempered with a sense of what is right as well as what is possible, a feeling of self confidence, the capacity for independent thought, and the ability to communicate effectively and efficiently. (1986, p. 3)

Industrial Arts Education

In order to present a definition of the industrial arts, it is appropriate to review the work of Bonser and Mossman (1924), who wrote:

> *The industrial arts are those occupations by which changes are made in the forms of materials to increase their values for human usage.* As a subject for educative purposes, *industrial arts is a study of the changes made by man in the form of materials to increase their values, and of the problems of life related to these changes.* (p. 5)

The content for this program focused on foods, clothing, shelter, utensils, records, tools, and machines. Many other definitions of the industrial arts have appeared in the intervening years, but few have had the clarity of direction and specificity of the Bonser and Mossman statement.

Industrial Technology Education

In one of the first publications issued by the Industrial Arts Curriculum Project (IACP), Towers, Lux, and Ray (1966) sought to "develop a rationale to guide the conceptualization of a more adequate structure or framework for the study of industry" (p. iv). They redefined industrial arts as "an organized study of the knowledge of practice within that subcategory of the economic institution of society which is known as industry" (p. 43).

This project reviewed analyses of the basic structure of knowledge in its attempts to provide a basis for the selection of content. After their review, Towers, Lux, and Ray defined the field of industrial technology, the study of industrial praxiology. They wrote: *"Industrial praxiology (technology) is that subcategory of praxiological (technological) knowledge which is derived from the study of principles of industrial practices"* (1966, p. 42). The major elements in industrial technology are presented in Figure 1.

Towers, Lux, and Ray went on to redefine industrial arts and to suggest a major change in its focus:

> *Industrial arts is an organized study of the knowledge of practice within that subcategory of the economic institution of society which is known as industry.* Industrial arts logically cannot be equated with indus-

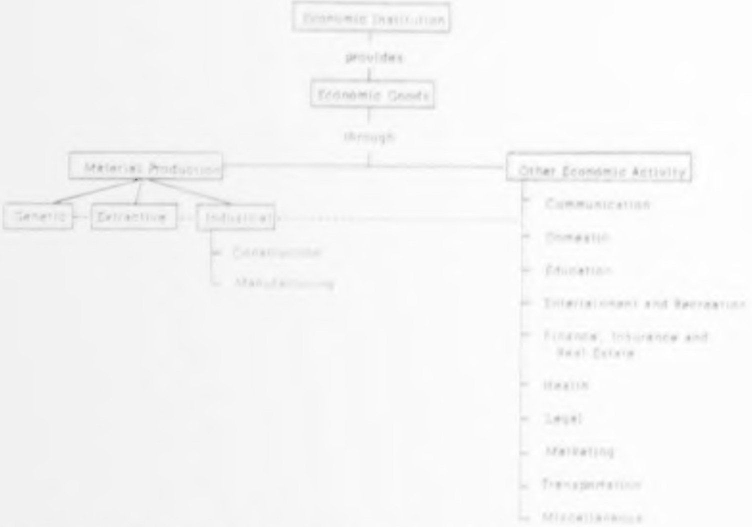
Economic Institution
provides
Economic Goods
through
Material Production
Other Economic Activity
Genetic
Extractive
Industrial
Construction
Manufacturing
Communication
Domestic
Education
Entertainment and Recreation
Finance, Insurance and Real Estate
Health
Legal
Marketing
Transportation
Miscellaneous

Figure 1. Elements of the Economic Institution
Source: Towers, Lux & Ray (1966), p. 73.

> trial praxiology (technology). Industrial praxiology (technology) is a body of knowledge which provides subject matter for the studies of the industrial-vocational student, the industrial technician, and the industrial engineer, as well as the industrial arts student, the college student of industrial psychology, and many others. Thus, industrial praxiology (technology) may be studied for many purposes and at many levels. Knowledge of industrial practices may be studied in industrial arts for the purpose of helping pupils gain an understanding of how they affect materials and humans in industry. Understanding, as used in this definition, includes both a knowledge of practices *and* the ability to apply the practices themselves. (1966, pp. 43-44)

Technology Education

In 1946 and 1947, William E. Warner and a group of graduate students at The Ohio State University developed a curriculum proposal entitled, "A Curriculum to Reflect Technology." The proposal stated that the "subject matter classifications (of technology) are conceived of as including: (a) power, (b) transportation, (c) manufacturing, (d) construction, (e) communication, [and] (f) personnel management" (Warner, 1947, p. 6).

Donald Maley, in *The Maryland Plan*, dealt with the problem of identifying the field of study. He wrote:

> Industrial arts, as a curriculum area, is defined as: those phases of general education which deal with *technology*—its evolution, utilization, and significance; with *industry*—its organization, materials, occupations, processes, and products; and with the *problems* and *benefits* resulting from the technological and industrial nature of society. (1973, pp. 2-3)

Snyder and Hales (1981), in the report of the Jackson's Mill effort, proposed these definitions:

> Industrial arts is a comprehensive educational program concerned with *technology*, its evolution, utilization, and significance; with *industry*, its organization, personnel, systems, techniques, resources, and products; and their social/cultural impact. To further clarify the definition, *technology* is considered as the knowledge and study of human endeavors in creating and using tools, techniques, resources, and systems to manage the man-made and natural environment for the purpose of extending human potential and the relationship of these to individuals, society, and the civilization process. *Industry* is considered as that section of the societal economic institution that utilizes resources to produce goods, services, and information to meet the needs and wants of individuals and society. Thus, the emphasis is on the human element—human endeavors. (pp. 1-2)

Delmar Olson enunciated his position on the study of technology in industrial arts in *Industrial Arts and Technology*, which appeared in 1963. It is generally accepted that the philosophy behind the technology education movement evolved from the ideas presented in this book (Jones & Wright, 1986). Jenks (1980) provided a key idea for understanding the difference between industrial arts and technology education when he wrote that "technology education, unlike industrial arts, does not use a modifier (e.g. industrial technology) and chooses to study technology in its entirety" (p.4)

Paul DeVore, who has maintained a leadership position at the cutting edge of the technology education movement for a significant period of time, is an advocate of the study of technology as an integrated, interrelated field. He wrote: "with the study of technology organized into a meaningful whole and placed with the humanities and sciences, the education and preparation of future citizens in an age of uncertainty, value conflicts, and limited resources is aided" (1980, p. xii).

Basic Assumptions

Industrial arts, as defined by Bonser and Mossman (1924), served two purposes: the vocational purpose and the general education purpose. Vocationally, industrial arts provided opportunity for the study of the processes of industry in order to develop skills and efficiency: "the vocational study of an industry includes provision for gaining both a knowledge of its processes and sufficient practice in their execution to develop skillful and efficient production" (p. 6). On the other hand, the general education purpose reflects the "point of view of the problems, opportunities, and obligations of the consumer and the citizen" (p. 7).

Bonser and Mossman defined five purposes for the study of industrial arts: "(a) a health purpose; (b) an economic purpose; (c) an art or aesthetic purpose; (d) a social purpose; and (e) a recreational purpose" (1924, p. 7). They went into considerable detail on the possible behavioral outcomes of industrial arts:

> What effects as a result of the work are expected upon the behavior of one who has studied the industrial arts? The answer may be expressed in this way: One who has properly studied the industries should:
>
> 1. Be aware of general health needs, be able to select and use foods and clothing so that they will help to keep him well, and be intelligent about all phases of cleanliness and sanitation in and around the home. This is the health outcome.
>
> 2. Be able to buy and use industrial products of good quality in material and construction and well adapted

to their purposes, at costs that are reasonable; to care for what is secured so that it will remain serviceable in its fullest possible measure; to repair, or supervise repairing, when it can be done to advantage; and intelligently to substitute inexpensive for expensive products when this is needed. This is the economic outcome.

3. Love that which is beautiful, and be able to select and use products which are beautiful in themselves, which are well adapted to the particular purpose for which they are chosen, and which fit harmoniously the surroundings in which they are placed. This is the art or aesthetic outcome.

4. Be sensitive to the well being of industrial workers, understand the conditions of the industries, and respond intelligently in all ways possible to help in regulating industry so that no one will suffer injustice or injury for the sake of unfair profits for employers, unfair wages for employees, or unfair prices for consumers. This is the social outcome.

5. Have permanent interests in the materials, processes, products, and achievements of industry which express themselves in observation and reading of the changes, discoveries, and inventions of industry as these are found in operation or described in current magazines or books; or as expressed in avocational construction of products of special appeal; or as satisfied by observing and enjoying products of use and beauty which one may not be able to possess but which are found in the homes of friends, in public buildings, in shops and stores, and in museums. This is the recreational outcome.

6. Be reasonably dextrous in handling materials, tools, machines, and products found in the general environment; be capable of doing or directing the simple kinds of repair work relating to clothing and the household where the specialist is not needed; and have such qualities as accuracy, neatness, and persistence reasonably well developed with reference to their application to the use or upkeep of industrial products. These are the outcomes incidentally developed through

> the appropriate realization of the primary outcomes. (1924, pp. 14-16)

Industrial technology, as viewed by IACP, represents a structured body of knowledge unique to industry; it is this body of knowledge that should serve as the content source for industrial arts. Towers, Lux, and Ray (1966) suggested that the instructional program in industrial technology should focus upon content from these fields: (a) industrial management technology—planning, organizing, and controlling; (b) industrial production technology—pre-processing, processing, and post-processing; (c) industrial personnel technology—hiring, training, working, advancing, and retiring; (d) industrial material goods—constructed material goods and manufactured material goods; (e) construction technology—construction management technology, construction production technology, construction personnel technology, and constructed material goods; and (f) manufacturing technology.

> Industrial technology education has these objectives:
>
> 1. Enables students to understand the concepts and principles, generalizations, problems, and strategies of industrial technology.
> 2. Encourages interest in and an appreciation for industry as that element of the economic system that provides industrial material goods for the satisfaction of human wants for those goods.
> 3. Provides knowledge and skills that will be useful in life situations of occupational, recreational, consumer, and social-cultural significance. (Lux, Ray, & Hauenstein, 1970, p. 3)

Technology Education

Lauda and McCrory (1986) observed that "our reality is, in essence, made up of three entities: humans, nature, and the means we have for articulation between human life and nature" (p. 21). This process of articulation, as it appears in the design of the technology education curriculum, is represented in Figure 2. The matrix in Figure 2 illustrates three contexts for the study of technology: transportation, production, and communication. The six elements (materials, processes, tools, energy, information, and humans) are studied at the three levels (handcraft, mechanization, and cybernation) across the three contexts.

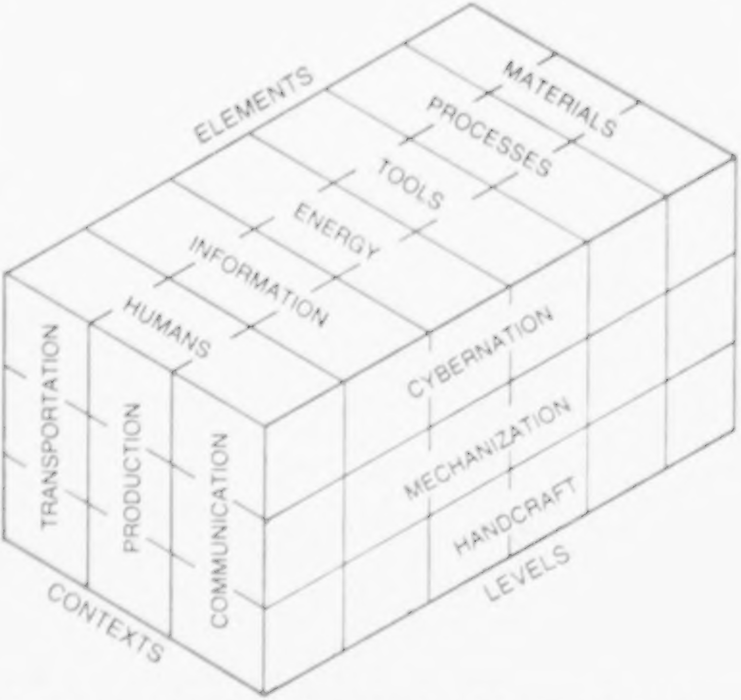
ELEMENTS
MATERIALS
PROCESSES
TOOLS
ENERGY
INFORMATION
HUMANS
TRANSPORTATION
PRODUCTION
COMMUNICATION
CYBERNATION
MECHANIZATION
HANDCRAFT
LEVELS
CONTEXTS

Figure 2. Content Matrix for Technology Education Curriculum
Source: Lauda & McCrory (1986), p. 34.

The Jackson's Mill Curriculum Interaction Model (Figure 3) classifies human technological endeavors somewhat more abstractly by identifying what people do, when it is done, and how it is done. This approach tends to be more generic and related to an understanding of the broad field of technology. However, it still does not meet DeVore's (1980) criterion that the field should be "organized as a meaningful whole" (p. xii). Swyt (1987) suggests that in order for this to occur, technology would need to be studied through these content organizers: (a) physical—motion, power, and work; (b) material—matter in non-life forms; (c) information—data, information, and knowledge; and bio—bio-

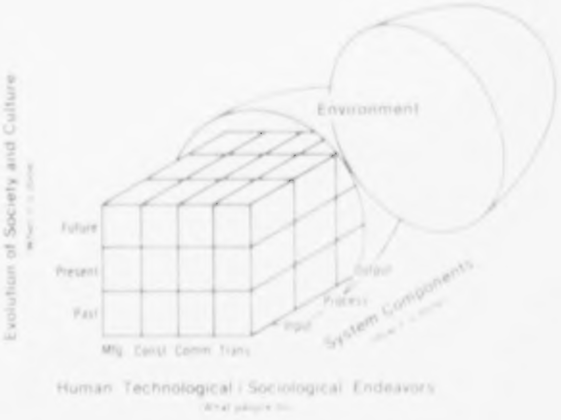
Environment
Evolution of Society and Culture
Future
Present
Past
Mfg.
Const.
Comm.
Trans.
Output
Process
Input
System Components
Human Technological / Sociological Endeavors
(What people Do)

Figure 3. Curriculum Interaction Model
Source: Snyder & Hales (1981), p. 18.

logically active agents.

Other concerns relative to technology education as general education have surfaced through the New York Futuring Project (Good, 1986), which utilized content organizers that are consistent with those suggested by Swyt. However, the New York group packaged those organizers around process issues. Responses to these issues have been reflected in the array of goals for technology education which have found acceptance, not only in New York, but also in Ohio (Ohio Department of Education, 1987) and Michigan (Education for Employment, 1986). These include:

1. Explore and experience the evolution of technology.
2. Explore and experience the resources (people, information, materials, tools/machines, capital, energy, and time) necessary for technology.
3. Explore and experience how people use technology to solve problems.
4. Gain an understanding of the similarities that exist among all technologies.
5. Gain an understanding of the all-encompassing nature and impact of technology.

6. Choose appropriate resources.

7. Demonstrate how resources are processed using the basic systems concept (input>output>feedback).

8. Understand the function of feedback in technological systems.

9. Solve problems using a systems approach.

10. Make decisions and choices about the selection of resources.

11. Develop creative solutions to present and future societal problems.

These goals, with their distinctive New York flavor (Good, 1986; Listar & Schiffman, 1986; The University of the State of New York, 1987), are endorsed by the Middle School Technology Education series of workshops in Ohio (Ohio Department of Education, 1987) and the Technology Education component of the Education for Employment (1986) program in Kalamazoo County, Michigan.

Commonalities and Uniqueness

In order to compare the similarities and differences among industrial arts education, industrial technology education, and technology education, a structure for comparison was developed. Because all of the programs purport to address general education, it was determined that questions or issues relating to program philosophy would serve as bases for classification. In the publication, *Process Model for Course of Study*, the Ohio Department of Education (1984) suggested that these questions should be considered when developing philosophical statements for programs:

1. What is the purpose of the program?
2. What can this program do better than any other curriculum program?
3. Should the activities of this program stress cooperation, competition, or both?
4. Should programs deal with controversial issues, or only those ideas for which there is established knowledge?
5. What should be taught—attitudes, basic skills, problem-solving strategies?
6. Should the program be based on the needs of the

local community, society in general, and/or the expressed needs of students? (p. 22)

With these questions in mind, Table 1 graphically depicts the similarities and differences among the program terms.

Table 1

Program Similarities and Differences

	INDUSTRIAL ARTS	**INDUSTRIAL TECHNOLOGY EDUCATION**	**TECHNOLOGY EDUCATION**
PURPOSE	Vocational and general education	Study of knowledge and practice of understanding	Study of knowledge and human endeavor affecting our artificial environment
WHAT IT DOES BEST	Develop efficient workers and intelligent and humane consumers	Gain understanding of how industrial practices affect materials and humans in industry	Know and appreciate technology
STRESS	Competition	Cooperation / competition	Cooperation / competition
EMPHASIS	Established knowledge	Established knowledge	Controversial issues / established knowledge
WHAT SHOULD BE TAUGHT?	Attitudes and basic skills	Attitudes, basic skills, problem solving	Attitudes, basic skills, problem solving
NEEDS MET	Local	Society; student	Student; society

Purposes

Industrial arts education serves two major purposes: a vocational purpose and a general educative purpose. The vocational purpose involves the "study of an industry to gain both a knowledge of its processes and sufficient practice in their execution to develop skillful and efficient production (Bonser & Mossman, 1924, p. 6). The general educative purpose assists the student "to become efficient in the selection, care, and use of the products of industry, and to become intelligent and humane in the regulation or control of industrial production" (Bonser & Mossman, 1924, p. 6).

Industrial technology education assumes that:

> Knowledge of industrial practices may be studied in industrial arts for the purpose of helping pupils gain an understanding of how they affect materials and humans in industry. Understanding, as used in this definition, includes both a knowledge of practices *and* the ability to apply the practices themselves. (Towers, Lux, & Ray, 1966, p. 44)

Technology education should "orient young people to the challenge, responsibility and opportunities of the technological age. It should be a broad approach and include a variety of technological concepts and experiences" (Phillips, 1985, p. 18).

What They Do Best

Industrial arts education prepares students to understand the processes of industry and to select and use the products of industry in an intelligent and humane fashion. It does this best in a project-oriented laboratory.

Industrial technology education allows students to gain an understanding of how industrial practices affect materials and humans in industry by providing practical experiences in industrial management technology, industrial personnel technology, and industrial material goods.

Technology education can help the student:

> Know and appreciate technology; apply tools, materials, processes, and technical concepts safely and efficiently; uncover and develop individual talents; apply problem-solving techniques; apply other school subjects; apply creative abilities; deal with forces that influence the future; adjust to the changing environment; become a wiser consumer; and make informed career choices. (ITEA, 1985, p. 25)

Cooperation/Competition

Traditional industrial arts, using the project approach, stressed competition. Industrial technology education and technology education, by nature of their focus, deal with ideas for which there is established knowledge. While both deal with problems of life, the primary focus of industrial arts is on the "study of the changes made by man in the forms of materials to increase their value" (Bonser & Mossman, 1924, p. 5). Industrial technology education bases its study on taxonomies that, by their nature, relate to established knowledge. Technology education has substance and, as such, relates to established knowledge. However, according to Waetjen (1985), "we cannot confine the study of technology to its technical aspects alone" (p. 9). Technology must be viewed multi-dimensionally, an approach which necessitates the review of controversial issues.

What Should be Taught

Traditional industrial arts programs focus on the teaching of basic skills and attitudes. Industrial technology education and technology education include problem solving as an essential element of instruction. As the world continues to experience explosive growth in knowledge and in technology, problem solving assumes an increasing role. There may be no other way to prepare students for a future in a world which is beyond the scope of current human imagination.

Needs

Throughout most of the first half of the 20th century, general education focused upon the needs of the local community. This emphasis reflected the agricultural and industrial cultures which prevailed during that era. It was also in accord with the classical philosophy of teaching. As technology has expanded human horizons in transportation and communication, and as educational philosophies have become more student-centered, industrial technology education and technology education are based upon the needs of students to prepare them for life in a global society.

Conclusions

Writing a paper such as this puts the author in jeopardy because of the possibility of offending everyone. The risk is worth the wrath if it serves to highlight these observations:

1. The progression from industrial arts education to industrial technology education is logical. In their development of a rationale for industrial technology education, Towers, Lux, and Ray (1966) noted:

> For more than half a century *industry* has been viewed as the source of subject matter for industrial arts. Despite this, an adequate structure of the knowledge of industry, as an essential aid in the identification and organization of industrial arts subject matter, has not been conceived. (The implication here that Bonser and Mossman's content categories are rejected as a viable structure for a study of contemporary industry is intended.) (p. 29)

Based upon the IACP view of contemporary industry, supported by, among others, the viewpoints of Warner and Olson, the progression to industrial technology education reflects a desire of the profession to keep up with the times.

2. The shift from industrial arts or industrial technology education to technology education does *not* follow a normal progression. Technology education breaks away from the industry model to a more broadly-based view of physical, informational, and bio-related technology issues. It concerns itself with systems, resources, and problem solving more than its predecessors. Programs that do not address content in this mode are more likely to be industrial technology education rather than technology education. However, the part of technology education which relates to physical technologies (construction, manufacturing, transportation, energy, and power) and informational technology (communication) can be traced to industrial technology. It appears that the transition to technology education follows the shift from an industrial society to a post-industrial society, which might be described as informational, third wave, telematic, or global.

Epilogue

It is encouraging to view the profession as a vibrant, viable entity that is adapting to change in a responsive, responsible, and scholarly fashion. This feeling of professional "warmth" is unfortunately chilled by the observation that there are still programs that do not meet the expectations outlined by Bonser and Mossman in 1924.

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TECHNOLOGY EDUCATION: ITS RESPONSE TO CHANGE AND TO SOCIETAL NEEDS

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The 20th century has been characterized by unprecedented change in every aspect of life. More change has occurred in this century, in fact, than has occurred in all of previous human existence. Harold Shane (1981) noted the rapidity of change from a historical point of view. It seems reasonable to conclude that for the first time in human history, we have been propelled from yesterday into tomorrow with no familiar "today" during which we can become acclimated to change.

Toffler (1970) quoted Robert Hilliard, who stated:

> At the rate at which knowledge is growing, by the time the child born today graduates from college the amount of knowledge in the world will be four times as great. By the time that same child is fifty years old, it will be 32 times as great and 97 percent of everything known in the world will have been learned since the time he was born. (p. 141)

Toffler's projection assumes a linear extrapolation of current events. It does not consider changes either in rate or in direction.

There are two basic ways to describe change: in terms of rate or in terms of direction. The rate of change has implications that are quite apart from, and sometimes more important than, the direction of change. One way to illustrate the rate of change is to divide the last 100,000 years of human existence into lifetimes of approximately 75 years (equivalent to an average lifespan in our society), or a total of 1333 lifetimes. Only during the last 60 lifetimes has it been possible to communicate effectively from one lifetime to another through writing. The printed word has only been available in the last six lifetimes. Only during the last two lifetimes has anyone, anywhere, used an internal combustion engine, and only in the most recent lifetime has anyone used electricity.

Another way of demonstrating the rapid rate of change in recent times is to consider that these events have occurred during the lifetime of a person who was born in 1940, and who is 48 years old in 1988:

1. Telecommunications became, for practical purposes, instantaneous.
2. The speed of information processing increased one millionfold.
3. The rate of population increase went up more than a millionfold.
4. Jet aircraft, radar, space missiles, and space satellites became commonplace.
5. Human hearts, kidneys, and livers have been transplanted successfully.
6. Landings on the moon and Mars were successfully completed.
7. Genetic engineering has become feasible.
8. Computers became common in everyday life.
9. Robots and lasers became commonplace in health care, industry, and business.
10. While three-fourths of the Americans employed by industry in 1940 were manufacturing goods, today more than 70% are providing services; we have changed from an industrial society to an information society (Bell, 1984; NEA Bicentennial Committee, 1977; Toffler, 1980).

Michael McDaniel (1974) listed seven factors that have contributed to the rapidity of change and to the nature of change. They deal primarily with social and cultural trends and with the way society is undergoing change:

> 1. Demographic change: sex and age patterns, death rates, lifespans, family size, and balance of youth versus old.
> 2. Technological innovation: adaptive changes in existing machines and productivity.
> 3. Social innovation: new arrangements, systems, or styles in educational, political, economic, military, and other dimensions.
> 4. Cultural-value shifts: changes in cultural axioms or values and ideas.
> 5. Ecological shifts: changes in the natural ecology, catastrophic events, and the pollution of rivers.

6. Information-idea shifts: scope, quality, and manipulability of knowledge; new conceptions of how things work.

7. Cultural diffusion: transfer of ideas, values, or techniques from one culture to another through war, invasion, advertising, and increased travel. (pp. 115-116)

One way to illustrate the direction of change is to consider world population growth. At the present time, population growth has expanded from 2% per millennium prior to the year 1000 to more than 2% per year—a thousand-fold increase (Hauser, 1971). If the population trend is charted on a two-dimensional graph, population growth has shifted from a nearly horizontal line to a nearly vertical line. See Figure 1.

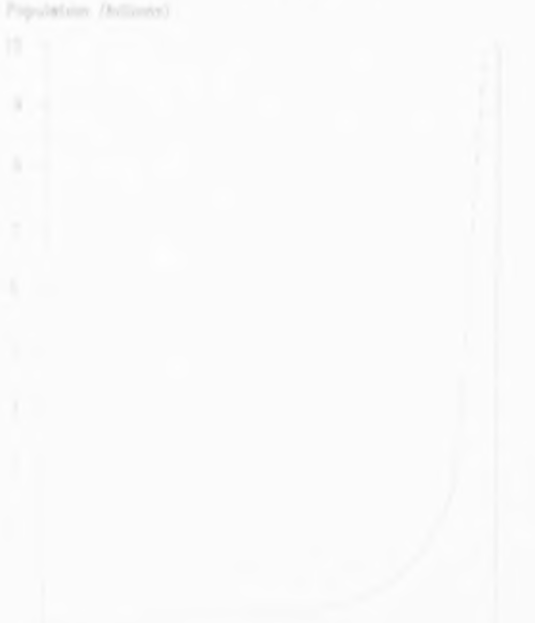

Figure 1. Past and Projected World Population, A.D. 1-2100
Source: World Bank (1984), p.73.

Other equally important directional changes in society involve advances in science, communication, production, energy utilization, and transportation. All of these affect the quality of life and have significant global impacts. Actually, in these areas of society, the rate of change during some periods of time approaches exponential proportions, as does population growth. Such dramatic rates of change have equally dramatic impact upon the society. For population growth, as well as developments in science, communication, production, energy usage, and transportation, the critical time period has been the present century.

Technology and Change

Technology has always been an influencing factor upon the process of change. Recent technological developments have presented us with opportunities to explore the farthest reaches of the solar system, personal computers, the capability of storing the equivalent of an encyclopedia on a small optical disc, and the replacement of human organs with manufactured ones.

Historically, technology, the application of theoretical knowledge to specific social and economic tasks, has been supported by science, the pursuit of knowledge and the understanding of the physical and human environment. The development is an inherently dynamic and cumulative process. It is dynamic because a technology is never perfect; there is always a need for improvement. As Henry Ford said of his firm, "If we have a tradition it is this: everything can always be done faster and better" (Constant, 1980, p. 12). Technology is cumulative, for one advance paves the way for another. The lessons learned in working with an existing technology very often provide materials, tools, and, most importantly, a knowledge base for the next stage of development.

The dynamic and cumulative nature of technological change sets it apart from many other human endeavors. Ignoring for the moment the social consequences of technology, the process of technological change is usually one of continuous improvement in the technical endeavor of a particular technology. As a device or a technical system evolves, it becomes more powerful and efficient.

Modern society is increasingly shaped by technology. As technological innovations become more complex, the related sociotechnical systems must adapt to sustain current levels of prosperity (President's Commission, 1981). Technological developments have produced spectacular successes. Technology has extended our lives, lightened some of our burdens, increased our standard of living, and kept us entertained. On the other hand, problems are created by technological developments. The advances of technology have left us with some unpleasant byproducts, such as environmental pollution and conflicting outcomes (Harmon, 1974).

Conflicting Elements

Successes	*Resulting Problems*
Prolonging the life span	Regional overpopulation; problems of the aged
Highly developed science and technology	Risks of mass destruction through nuclear and biological weapons
Machine replacement of manual and routine labor	Exacerbated unemployment; urbanization
Advances in communication and transportation	Increasing air, noise, and land pollution; information overload; vulnerability of a complex society to breakdown
Efficient production systems	Dehumanization of ordinary work
Affluence	Increased per capita consumption of energy and goods, leading to pollution and depletion of the earth's resources
Satisfaction of basic needs	Worldwide revolutions of "rising expectations;" rebellion against non-meaningful work
Expanded power of human choice	Unanticipated consequences of technological applications
Expanded wealth of developed nations	Increasing gap between "have" and "have-not" nations; frustration of the "revolutions of rising expectations"

Too often, technological change is an uncertain process, with many unforeseeable consequences. However, technologies do not simply stand or fall on their own merits; their success or failure can be controlled by an educated citizenry (Volti, 1988).

Technology has the potential to affect every aspect of work, play, and learning. It is a powerful force, but should not be employed just because it is available. We don't have to resign ourselves to the inexorable advance of technology while passively hoping that it will produce more good than harm. Technology remains a human creation; humankind can determine the applications of technology, as well as the future course of technological development.

Modern technological advances have increased the pace of change. Even so, it must be remembered that technology is a human creation, and that its ultimate source is knowledge. But for technology to be truly beneficial, more than technical knowledge is required by the people. Our challenge in technology education will be to develop and apply a holistic approach to the study of technology. The content must be centered around the technical concepts and principles of socio-technical systems, as well as the surrounding base of ethical, sociological, ideological, political, and economic principles. Such a holistic approach will assist us in defining our real needs and creating the technologies which will meet those needs.

The Response of Education to Change

In times of great change, society looks to its schools to help its citizens adjust to the new conditions. Society often demands that educational institutions modify their programs so that students will be able to function more effectively to the demands of the time. To respond to such calls, educators need to rely upon their philosophical foundations to guide their decisions regarding the purpose of schools, as well as their more detailed decisions dealing with the specific nature of their programs.

Education is purposeful; it is concerned with outcomes that are usually expressed at several levels. The most general levels are reflected in statements of aims and goals; the most specific level is exhibited in statements of objectives. But, whatever the level of specificity, educators use these statements of purpose to guide the development, implementation, and evaluation of educational programs.

The term, aims, is often used interchangeably with such terms as goals, ends, functions, general objectives, and purposes (Ornstein, 1985). Aims serve the critical function of guiding education, but they cannot be directly observed or evaluated. They are orientations, not specific and quantifiable outcomes. Educators of every age are challenged to interpret the aims of society and express them in terms of educational goals. Because of their global nature, only a few aims are necessary to guide education. For example, Ralph Tyler (1968) summarized the aims of American schooling as:

1. Development of self-realization.
2. Making individuals literate.
3. Encouraging social mobility.
4. Providing skills and understandings necessary for productive employment.
5. Furnishing tools requisite for making effective choices regarding material and nonmaterial things and services.
6. Furnishing the tools necessary for continued learning.

These all-encompassing aims reflect a progressive philosophy of education applicable to the needs of today's society. However, it is common for educational aims to change as dictated by the needs of society. The challenge for educators and curriculum leaders is to analyze the aims of education to insure that they will be relevant to the present and to the future.

Aims of education provide the foundation upon which to develop program goals and objectives. Where aims are general statements, goals and objectives are statements of endpoints or outcomes of education. These three components guide the process of education and are generated in response to the general concerns of society.

The Role of General Education in a Changing Society

The separation of the intellectual from the practical, and of the mental from the physical is less pronounced in present society than in earlier times. Today, as a result of the numerous new technological developments, the typical worker is striving to obtain increased new opportunities and to become more involved in making work-related decisions. Ours has truly become an education-intensive society in which many earlier distinctions are becoming blurred. Joseph F. Coates (1983) stated:

> Technological advance is taking place in concert with these new developments and with the lively current interest in social independence and local governance. One consequence is that the traditional social and work-related distinctions are rapidly blurring. Among these are the distinctions between work and leisure, between white-collar and blue-collar workers, between vocational and non-vocational education, and between professional and non-professional work. (p. 29)

Because we have become a classless and education-intensive society, general or liberal education is a high priority among educators. The broad goals rooted in general education are

> to transmit a way of life, an important feature of our way of life lying in the fact that it is democratic; to improve that way of life, the most feasible method being by training for effective critical thinking; to meet the needs of individuals in the basic aspects of living. (Wilber, 1954, p. 15)

These goals for general education have been expanded to include a broader perspective of the basics in education today. They are to help students develop:

1. The ability to make informed career choices.
2. The ability to communicate effectively.
3. Intellectual curiosity and creativity.
4. A continued commitment to learning.
5. A capacity for and interest in serving others.
6. A sense of responsibility both to specific communities and to a culturally pluralistic world.
7. Greater personal satisfaction through access to the larger social, political, economic, scientific, technological, and aesthetic culture.
8. The ability to do critical thinking.

Because our knowledge is changing rapidly, we must continually ask ourselves what is the most worthwhile knowledge necessary for coping successfully with a changing society. Educational programs need to provide all human beings with the necessary skills and the proper attitudes to assist them in adapting to change. We need to organize criteria to be used for the systematic selection of content and activities for students. These criteria may include:

1. Knowledge of the basic tools as means rather than ends, for without the basics (reading, writing, and mathematics), they cannot advance in any subject field.
2. Knowledge should facilitate learning how to learn. Teachers should assist the learner to acquire the skills, tools, and processes necessary for lifelong learning.
3. Knowledge applicable to the real world.
4. Knowledge should prepare the individual for the world of technology. Individuals must learn to live with computers, robots, lasers, telecommunications, and space exploration.
5. Knowledge should improve the learner's self-concept, awareness skills, and sense of personal integrity. It should provide cognitive, affective, and psychomotor learning experiences.
6. Knowledge should develop critical thinking to enable learners to be able to make informed decisions.

These six knowledge skills provide the learner with the bases for coping with change—and for understanding and analyzing the trends that impact upon society. These knowledge skills are closely related to the "Basics for Tomorrow" identified by the Education Commission of the States (1983):

1. Evaluation and analysis skills.
2. Critical thinking.
3. Problem solving strategies.
4. Organization and reference skills.
5. Synthesis.
6. Application.
7. Creativity.
8. Decision making given incomplete information.
9. Communication skills through a variety of modes.

Contributions of Technology Education to General Education

Throughout history, humans have sought to apply scientific knowledge in ways that enhance the material culture, enlarge their capacity to produce goods and services, or physically defend their territorial and ideological borders. This application of scientific knowledge is what is commonly referred to as technology. Technology is visible everywhere and has brought enormous material benefits as well as increasingly complex social and environmental problems. It is critical to understand the tensions and conflicts that arise over the uses and consequences of technology as human choices are made about the technologies which will direct the future.

The kind of education that students receive in schools determines the quality of society. Walter B. Waetjen (1987) stated: "Schools are created by a country to perpetuate the important aspects of society. Our society has three major characteristics: it is democratic by choice and persuasion; it is technological in nature; it is an educated society" (p. 7).

The transmission of culture is the primary mission of a society's educational system. The values, beliefs, and norms of a society are maintained and passed on to the next generation, not merely by teaching about them, but also by embodying them in the very operation of the educational system. The development of culture has come about through modifications in the knowledge and beliefs of societies. This has enabled human beings to gain some measure of control over their own evolutionary process by freeing them from biological and environmental constraints.

Because the American culture is characterized as distinctly technological, it is the function of the schools to provide every student an insight and understanding of the technological elements of society. This is especially important in the realm of general education. Today's students need to be technologically literate for informed participation in a democratic society, enabling them to act responsibly in the light of the values and demands implicit in freedom. More and more, the issues confronting our citizens—toxic waste disposal, acid rain, the use of life-support systems, and a hundred more—implicate technology as part of the problem and as part of the solution.

General education must not be viewed as a single set of courses, but rather as a body of knowledge, found throughout the curriculum, that is indispensable to effective functioning in daily life. Technology education contributes significantly to this body of knowledge. The goal of technology education should be to provide a sound general education to all Americans, one that prepares them to live freely and perform ably in a rapidly changing, technologically complex and independent world (Bell, 1988).

Our society has changed radically and rapidly, due largely to the impact of science and technology. Thus, it is important to justify technological knowledge as part of the essential content for a general or liberal education on the grounds of its relevance to questions of meaning and human curiosity.

General education has always been an important concern of technology education. As Bonser and Mossman (1924) stated, "*industrial arts is the study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes*" (p. 5).

Although technology education is viewed as a new curriculum emphasis and a new strategy for teaching, it continues to contribute to the goals of general education. The subject matter for industrial arts was centered around the processes and materials of industry. Technology education is much broader. Industry uses technology, but technology also exists outside of industry.

The term, technology, is difficult to define. One definition which addresses technology as a process has been gaining acceptance: *Technology is the application of knowledge to satisfy human needs and wants, and to extend human potential.* Whereas industrial arts purports to take its subject matter from industry, technology education draws the content from the more pervasive influence of technology in general.

Through modifications in knowledge and conversion into technology, individuals and societies have built social organizations and ideologies to regulate their own behavior caused by the changes produced by science and technology. Thus, technology, the instrumental mode of rational action, is created by human beings to expand the realm of practical possibility (Hannay & McGinn, 1980). For example, the electronic revolution has enabled individuals to extend the functions of human senses beyond time and space. At the same time, electronic technology has magnified the capacities of cognitive processes. These effects, empowered by human intelligence and creativity continually bring about such achievements as new energy conversion methods, explorations of space, and artificial intelligence.

Education has become more important as scientific and technological developments have advanced and the frontiers of knowledge have expanded. This increased knowledge base has been a motivating force to bring about changes in education. During the 1960s, emphasis was increasingly placed upon knowledge as a basis for making curriculum decisions concerning general education. Numerous curriculum projects raised basic questions about the purposes of the industrial arts curriculum, offered alternative knowledge structures, and mapped new directions for the field. Much of the effort of the profession during the 1960s and later led to the identification of the essential content base for the study of technology for the attainment of technological literacy.

Modern technology education programs emphasize knowledge of our technological world for its own sake, not for the utilitarian value of the knowledge. There simply are some things about our technological society that people ought to know. For example, it is important to learn or recognize relationships among parts, a process variously known as synergy, systems, holism, and ecology. This emphasis on connectedness and interdependency is vital to the goals of general education. Connectedness requires seeing any entity, event, or idea in relation to its effects and what affects it, rather than seeing only its essential characteristics.

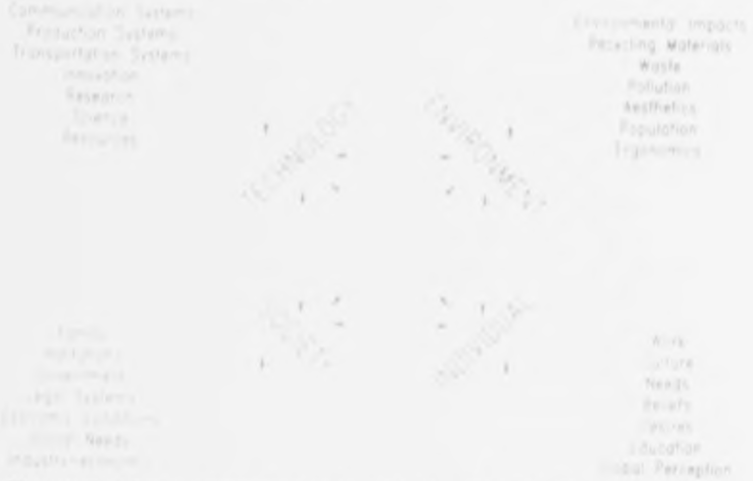
Communication Systems
Production Systems
Transportation Systems
Innovation
Research
Science
Resources
TECHNOLOGY
ENVIRONMENT
Environmental Impacts
Recycling Materials
Waste
Pollution
Aesthetics
Population
Ergonomics
INDIVIDUAL
Family
Government
Legal Systems
Economic Conditions
Social Needs
Work
Culture
Needs
Beliefs
Desires
Education
Global Perception

Figure 2. Macro Approach to the Study of Technology

Technology education emphasizes learning to see connections among events and societal issues. For example, a societal issue with numerous technological relationships is that of obtaining adequate energy supplies. This problem has many aspects, all of which are important to individuals and to society. To understand the many limitations, side effects, and benefits of the various energy sources, such as fossil fuels, solar energy, and nuclear energy, one must be literate about each of the technologies involved. These issues are of obvious importance to all citizens, both on local and on global scales.

The energy issue is just one of many that the general populace must face daily. Technological literacy is necessary to comprehend:

1. Interrelatedness: conceptualizing links between events, entities and ideas and the larger context within which they occur.
2. Interdependency: conceptualizing mutual dependency or reciprocity of events, entities, or ideas—seeing that the impact on one part has ramifications for the other parts and for the whole.
3. Holism: conceptualizing a totality rather than considering discrete or individual elements that only partially depict that totality.
4. Structure: conceptualizing the underlying and relatively stable relationships that exist among events, entities, and ideas which unify any totality.

Technology education concerning values is important in general education—not seeking one right way to behave, but recognizing that choices cannot be avoided. Students should be aware of how many choices they make, how these choices are based on values, and how to make informed choices regarding technological options.

Technology education courses should include not just technical content, but also the social and cultural elements that are required for making choices among the numerous options available. These elements include:

1. How human choices influence the results and the dominant values of other units.
2. How these choices have been made in the past.
3. How some of the choices might otherwise have been made.
4. How choices are made, evaluated, and used to explain phenomena.

The New Basics for a Technological Society

Technology education and its predecessors have been active throughout history, providing learning experiences that prepare individuals for change. As the societal needs have changed, the objectives, content, and learning activities have also changed. The field has dealt continuously with the perennially incomplete tasks of deciding what students should learn, what schools should teach, and how it should be taught. We must continue to ask ourselves what is the most worthwhile knowledge for our field if our programs are to remain relevant.

In this context, the questions become: (a) which specific concepts and principles should be taught; (b) should the emphasis be placed on content or process; and (c) which technological skills, attitudes toward the use of new technologies, and knowledge are necessary to be functionally literate?

Some educators argue that it is more important to learn process than content. Such a statement dichotomizes content and process, when in reality they should receive equal emphasis. In truth, process is a type of specialized content, related to methodology and procedures. Parker and Rubin (1966) indicated that process suggests "random or ordered operations which can be associated with knowledge and with human activities" (p. 6). Various processes can help to create knowledge, to communicate knowledge, and to utilize knowledge.

Content is important in technology education, because the facts, concepts, principles, and generalizations should enable students to gain understanding and to apply that understanding to daily living in the present and in the future. The content selected for study should contribute to the students' knowledge or level of understanding (Ornstein and Hunkins, 1988). Content to be learned is significant only to the degree to which it contributes to the basic ideas, concepts, principles, and generalizations of the objectives, and to the development of particular learning abilities, skills, processes, and attitude formation on the part of the learner.

The objectives of the technology education curriculum have been stated broadly and include elements of both content and processes. The learning activities are designed to develop within students competencies that will enable them to survive in a world of dynamic change and ever-increasing complexity.

Technology education is an alternative to traditional industrial arts education in which the emphasis is shifted from crafts and industry to the broader study of the resources, systems and impacts of technology. It focuses on a systems approach to develop technological literacy. The systems of communication, production, and transportation provide broad content areas of study (Snyder & Hales, 1981).

Technology education is interdisciplinary in nature in that it provides a vital link in the mathematics/science/technology triangle to assist with understanding, living, and working in modern society. (Figure 3)

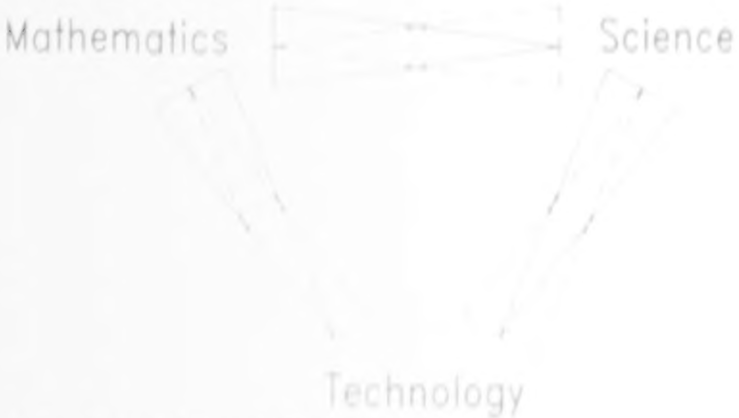

Figure 3. Math/Science/Technology Triangle

The interdisciplinary approach centers upon the desirability of providing instruction which allows the learner to understand relationships. Technology education is concerned with the relationships among science, mathematics, and technology.

Technology education also has strong social and environmental linkages. These linkages are essential to understanding, decision-making, and planning for the future. Technology interfaces with the biological world as we continually improve our prospects of health, well-being, and longevity. The degree to which the products and impacts of technology can be controlled in a democracy depends upon the pervasiveness of technological understanding among the population.

Technology education has been defined by the International Technology Education Association (1985), as "a comprehensive, action-based program concerned with technical means, their evolution, utilization, and significance; with industry, its organization, personnel, systems, techniques, resources, and products; and their social/cultural impact." (p. 25)

Programs are designed to fulfill individual and societal needs. Since technology is a process that brings together human and material resources to solve problems, and since understanding is a prerequisite for control, the study of technology is fundamental for all persons.

During the past several years, topics related to technological literacy and lifelong learning have received increasing attention by educators. In *Educating Americans for the 21st Century*, the National Science Board Commission on Precollege Education in Mathematics, Science and Technology (1983) stressed the importance of technology education directed toward the needs of future citizens: "Students must be prepared to understand technological innovations, the productivity of technology, the impact of the products of technology on the quality of life, and the need for critical evaluation of societal matters involving the consequences of technology" (p. 44).

This prescription for the study of technology involves not only knowledge, but also the process skills identified by Warnat (1983): "critical thinking, problem solving, creativity, decision making, communication, analysis, synthesis, and evolution" (p. 12). These process skills provide for the lifelong learning that is critical to the study of technology. Individuals need to acquire these process skills, along with learning how to learn in order to cope with technological and social changes in the future. Since all education springs from some image of the future, the challenge for technology education is to create programs that will enable all students to function optimally in a future society. Programs need to be continually updated in content and teaching strategies so that they will assist the learner to:

1. Interpret the evolution of technology and its relationship to humanities, sciences, society, and industry.

2. Develop an understanding of the impacts and consequences of technology and exercise control based on need and desirability of technological developments.

3. Develop creative ways to utilize technology to create solutions to present and future societal problems.

4. Explore and develop human potential related to responsible work, leisure, and citizenship roles in a technological society.

5. Make informed decisions as consumers of technology.

6. Reinforce basic skills that interrelate technology to other

school subjects.

7. Establish beliefs and values in the use of technology and how it alters human capabilities and environments.

8. Develop an understanding of resources, processes and outputs and their interrelationships within the technological systems of communications, production, and transportation.

9. Develop the abilities to think, create, and learn.

10. Understand that technology is a human invention and can be controlled by a citizenry possessing technological literacy.

11. Develop global perspectives on the relation of technology and society within the "spaceship earth" concept.

The use of technology is a dominant feature of all human societies. The technologies strongly influence the way we live and work. Equally important, but less obvious, is the fact that technology itself is a product of social, economic, political, and cultural patterns. It is an immensely powerful force in our world, and its material benefits cannot be separated from its consequences for people and the societies in which they live.

Technology education has made dramatic and significant transformations in goals and content during the past decade. All over the country, teachers and curriculum developers have made technology education a healthy and viable subject in the school curriculum. The task of restructuring the program has not been easy, but the results have identified relevant knowledges and skills to be developed through lifelong learning. The challenge for the future is to continue to generate images of an anticipated future and then to modify the technology education program to fit into and foster those images. Only then can we provide relevant experiences that will help learners develop the insights and skills they need to deal effectively with the ever-changing technological society.

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TECHNOLOGY EDUCATION AS A PART OF UNDERGRADUATE LIBERAL EDUCATION

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> The ascent of man will go on. But do not assume that it will go on carried by western civilization as we know it. We are being weighed in the balance at this moment. If we give up, the next step will be taken—but not by us. We have not been given any guarantee that Assyria and Egypt and Rome were not given. We are waiting to be somebody's past too, and not necessarily that of our future. (Bronowski, 1973, p. 437)

For nearly a century, educators in manual arts, industrial arts, industrial education, and technology education have organized their programs to begin with general awareness activities at the lowest grade levels, move to exploration and orientation at the next level, and on to job preparation at the upper high school and post-high school levels. Hence, the curriculum is a pyramid-like organization designed to go from broad general education to narrow specialized education in incremental steps as the student progresses from grades K through 12 and beyond. An increasing number of educators, however, are arguing that technological literacy should be a part of general education at all levels, including the college level.

This paper will focus on the current attempts at teaching technology as a part of the liberal arts at the college level. Before examining these programs, definitions of technology and technological literacy will be explored and the imperative for including technological literacy will be defended. Examples of current literacy programs will then be described and some comparisons made with technology education. Finally, the involvement of the technology education profession in the college level technological literacy movement will be discussed.

Definitions

Technology

Mitcham (1980) suggests that technology can be understood in five ways: as object, as process, as knowledge, as volition, and as either ancient or modern technology. Perhaps at the most obvious and simplistic level, technology is seen as *object*. This includes artifacts, tools, machines, electronic devices, consumer products, and gadgets created by man to fulfill some human needs or wants. Writers have attempted to classify technological objects by different criteria. For example, machines can be seen as active, as in the application of the laws of mechanics to help people do work, or as passive physical objects, such as architectural structures, reservoirs, and canals. Mumford (1967) argued that a group such as the Egyptian workforce that built the pyramids could be considered a machine—a "megamachine."

Technology as *process* can be viewed as the production of artifacts, a focus of engineers, or as the use of artifacts, a focus of social scientists (Mitcham, 1980). The engineering approach includes identification of the problem and the application of mathematics, science, and/or other appropriate problem-solving techniques in the design process. Engineering design, Mitcham states, "mediates between scientific knowledge and social exigencies" (1980, p. 308). In this sense, technological decisions must often be made without full knowledge of the impacts of a particular decision; for example, a doctor prescribing a drug which has been shown to have ill side-effects in some patients cannot know the outcome of the drug therapy with a specific patient.

The solution of an engineering problem is not always an artifact. For example, determining the queuing formula for regulating the traffic over the Oakland-San Francisco Bay Bridge (or any other heavily used restricted trafficway, for that matter), does not result in an artifact. While traffic lights may be used to solve the problem, the technological solution is not the invention of the traffic light but the determination of the timing of the lights and the designation of in-going and out-going lanes at different times of the day.

Technology as process from the social science perspective is illustrated by Jacques Ellul in *The Technological Society* (1964) and in *The Technological System* (1980). Ellul sees technology as process or means that has become a system, the reason for which is technological growth or progress (1980). His concern focuses on the dehumanizing effects of the technological process.

The third view of technology—as *knowledge*—is defended by Skolimowski. He stated simply, "Technology is a form of human knowledge" (1966, p. 372). Skolimowski argues that "technological progress is the key to the understanding of technology" (1966, p. 373). In the process of solving technical problems, knowledge is increased. Thus, knowledge is the by-product, not the goal; yet the knowledge is precisely that by-product which will help solve the next technical problem in which new knowledge is gained. Hence, progress continues.

Technology as *volition* is at the other end of the spectrum from technology as object. Volition refers to the act of willing, of having purpose and direction; the act or faculty to will by which the resources available are directed toward a desired end. Those who hold to this understanding of technology do not usually deny the other components of technology; rather, as Mitcham (1980) suggests, volition attempts to join together the elements of technology; it includes aims, intentions, desires, and choices. This position can lead to questions regarding the broader implications of a certain technological process or artifact, or, more specifically, the social, political, economic, psychological, and/or ethical dimensions of the respective technology. Frey notes that making a technological object has "two possible connotations: design considerations and motivation to produce" (1987, p. 16). The first includes aspects related to reliability, durability, aesthetics, costs, and potential market value. The second, motivation to produce, refers to the questions surrounding the reasons the object was built, whether to wage war, reduce poverty, produce more or better crops, or to make money. That technology has had a profound effect on society is obvious; it has changed our work, it has changed the nature and relative importance of our major institutions, and it has changed our morality. Hence, the statement that technology is neither good nor evil needs to be modified by adding that *neither is it neutral.*

The concept of *ancient versus modern technology* relates to how an artifact is made and how close to nature the craftsman is. Mitcham explains the differences this way:

> Ancient technology incorporates individual objects

> fabricated with naturally available energies and materials on the basis of intuitive knowledge for the limited purposes of usefulness and pleasure within a variegated spectrum of activities. The ideal type for ancient or traditional technology is the handcrafted making and using of utensils; as such, a better word for it might be "technics" (from the Greek *techne*) or "art." Modern technology, by contrast, involves mass-produced objects designed to utilize abstract energies and artificial materials on the basis of scientific theories for purposes of efficiency, power, or profit. (1980, p. 322)

Looking at technology as object, as process, as knowledge, as volition, as ancient or modern—however interesting and informative—does not provide us with a concise working definition. Allan Pfnister, Vice Chancellor for Academic Affairs at The University of Denver, refers to the intervening aspect of technology. He states, "It is a form of intervention that employs tools, techniques, knowledge, resources, and systems for the purpose of affecting the human environment and its organization" (1985, p. 11). Pfnister elaborated further on technology, saying that it is "preeminently a social process, and is not to be thought of as something affecting humanity from without" (1985, p. 4).

Participants in the Jackson's Mill Industrial Arts Curriculum Symposium defined technology as

> the knowledge and study of human endeavors in creating and using tools, techniques, resources, and systems to manage the man-made and natural environment for the purpose of extending human potential and the relationship of these to individuals, society, and the civilization process. (Snyder and Hales, 1981, p. 2)

Both of these definitions are comprehensive in the sense that they include all four aspects: object, process, knowledge, and volition ("for the purpose of"). The same can be said of the following definition by Cutcliffe:

> Technology is a social process in which abstract economic, cultural, and social values shape, develop, and implement specific artifacts and techniques that emerge

> from the distinct problem-solving activity called engineering which is embedded in that process. (Waetjen, 1987, p. 30)

Despite the similarities in these three definitions, they were written for different audiences. The Jackson's Mill authors were writing primarily for the industrial arts (now technology education) profession; Pfnister and Cutcliffe were both seeking support for technology education in the liberal arts college curriculum. However, Cutcliffe's definition differs in two significant ways from the other two: he gives much more attention to the milieu or context which affects technology. Also, Cutliffe gives a disciplinary locus (engineering) to the study of technology. In contrast, Pfnister's goal is to see technology taught as part of all the disciplines. The Jackson's Mill group concluded that technology education should rightfully be the domain of industrial arts. These differences will be explored further in the next section.

DeVore's definition of technology is similar to the Jackson's Mill definition. However, he departs from that definition in suggesting that technology is a science (1987). Given the common understanding that the sciences include that group of disciplines in which natural phenomena and natural laws are studied, DeVore apparently redefines science in order to include technology as a science. In this regard, one must also be aware of the difference between scientific method and the technological approach to problem-solving.

Another view of technology is that it is an applied science. This point of view is given by John Truxal, who comes out of the engineering profession and is Project Director of the New Liberal Arts Program. The NLA is sponsored by the Alfred P. Sloan Foundation to teach technology education as part of the general education core at the undergraduate level. Truxal defines technology as: "simply the application of scientific knowledge to achieve a specified human purpose" (1986, p.12).

In response to both DeVore's and Truxal's definitions, one must examine the difference between science and technology. In drawing this distinction, Skolimowski made the oft-quoted statement, "In science we *investigate* the reality that is given; in technology we *create* a reality according to our designs" (1966, p. 374). "In short," he wrote, "science concerns itself with what *is*, technology with what *is to be*" (1966, p. 375). One can think of numerous examples of technology that preceded science. Fire was used for millennia before the chemistry of combustion was understood and the laws of thermodynamics defined. Wine was fermented and drunk for centuries without an understanding of the chemistry of fermentation. Historically, technology has usually led science. We can give examples, however, of science being ahead of technology, especially in the current age. One such example is the contemporary scientific understanding of fusion, but our inability to sustain the fusion process with current technology.

Technological Literacy

Some may believe that the concept of technological literacy is a fad, or, at the minimum, that technological literacy is a new term for something that our field of study has been doing for years. *Most* of the pressure for our profession to consider technological literacy has come about as a result of the activity of groups outside our field who are teaching technology with different content and in different contexts than most of us. Leaders in industrial arts, now technology education, who have promoted the general education value of our field of study, have too often failed to consider what the characteristics of a technologically literate adult should be. The curriculum has usually been designed to provide the highest level of the general education component of an industrial arts/technology education program at the junior high level. How much scientific literacy, mathematical literacy, or English literacy would our college graduates have if they had stopped their study of English, mathematics, and science education at the junior high level?

That our field—technology education—has begun to take the goal of technology literacy seriously is shown by the increase in the number of articles which have appeared in the professional journals and the themes or topics discussed in professional conferences since 1980. Another example of the new interest shown in this area was the development of a technology literacy test for 12th grade high school students in the United States under the auspices of a grant from the American Council on Industrial Arts Teacher Education (Smalley, 1984).

The definitions of technological literacy are as diverse as the definitions of technology, and they frequently reflect the field or discipline of the definer. Rustum Roy, editor of the *Bulletin of Science, Technology & Society*, and a leader in the Science, Technology and Society (STS) movement, explained the nature of technological literacy:

> Every discipline develops a certain minimal threshold of learning that we call literacy. . . [In the field of technology education, I have described this level as:] Technological Comfort, Competence, and Control. I claimed that Technological Literacy allowed one to become more comfortable in our technological milieu; Technological Literacy made one competent in one's work whatever it be in the societal context we find ourselves in; and, finally Technological Literacy implies that one has some sense of control over the choices which shape one's life. (1987, pp. 4, 6)

Carrel listed six basic points characterizing technological literacy:

> 1. Technological literacy is but one aspect on a continuum of attributes of *technological preparedness.*
> 2. The individual's needs and society's needs for technological literacy are not necessarily the same.
> 3. Technological literacy is person/situation specific, not generic.
> 4. Technological literacy is *dynamic* and *variable* not static and singular.
> 5. Technological literacy is a product of the *cognitive* domain; not of the affective or the psychomotor domains.
> 6. Technological literacy may be described, tentatively, as the cognitive state of readiness of an individual to respond to his or her technologically generated needs deemed important to society. (1987, pp. 3-4)

Waetjen does not agree that technological literacy is only a product of the cognitive domain. He notes that the technologically literate person not only has certain understandings and knows certain information, but has developed an appreciation for that field. He also states that the literate person must be able to *use* the tools and materials of the literacy suggesting the inclusion of the psychomotor domain. He elucidates the topic further:

> Most [of the definitions of literacy] hold that literacy (of

> any kind) involves understanding and appreciation, that is, the learner comes to understand something and also to show an appreciation for it. Using the example of language, one must understand the language in order to be literate. Concurrently, one would learn to appreciate that the language enables us to remember the past, communicate with others, and to think. As important as those are, they fall short of the mark, for if one is fully literate it is necessary to be able to *use* the language. Individuals must be able to speak and write the language—not only to understand and appreciate it. Indeed, that quality is implicit when we describe a literate person.
>
> Technological literacy, then, means that a student must understand basic scientific concepts; know societal needs and moral constraints; be able to cognize the application of scientific principles to tools and materials; and, to a certain extent be able to utilize these tools and materials. A person having those characteristics would not qualify as an engineer, therefore, what we are talking about is technological literacy to be advanced through general education. An engineer, or any other kind of technologist, requires far more sophisticated knowledge (1987, pp. 30, 31).

Some definitions or lists of characteristics of technologically literate persons include an emphasis on environmental, societal, and human impacts (DeVore, 1987; Loepp, 1986; Truxal, 1985; Hughes, 1986). The Advisory Council of the International Technology Education Association, in discussing technological literacy, indicated that "not only should students study the benefits of technology, but also the 'down side' of technology—the possible environmental and cultural consequences" (International Technology Education Association, 1986, p. 5). Ellul is not only interested in the impacts of technology but also in the environment that spawns technology. He wrote, "No technology however autonomous it may be can develop outside a given economic, political, intellectual context" (1980, p. 31).

Another area in which definitions of technological literacy differ has already been noted: namely, whether literacy includes the ability to apply as well as to understand and appreciate. But even if agreement were reached that technological literacy includes the "ability to apply," further clarification is needed, since some writers seem to assume that application includes psychomotor skills, while others emphasize the application of the problem-solving components of technology. Loepp was apparently referring to psychomotor skills when he stated that the technologically literate person "should be able to understand and use the basic mechanical, thermal, fluidics, and electronic principles incorporated in the devices that extend human potential," and "should be able to use the basic tools, materials, and processes of technology" (1986, p. 348). Does this mean that one is technologically illiterate if one has not taken a course in fluidics or electronics? Does this mean that an engineer who knows the theory and principles of heating system design and is able to design a complex heating system is technologically illiterate because he/she has never actually done hands-on plumbing and duct work? Or is Loepp referring to designing and planning as being able "to use?"

The New Liberal Arts Program (NLA) refers unequivocally to the engineering approach to problem solving as well as to how devices work *as the technology* which a technologically literate person should be able to use. In identifying the content of technological literacy programs, Truxal, representing the NLA approach, states that technology appears in two forms: system analysis and artifacts. He goes on to write that these forms must be understood in order to understand technology. "System analysis is the *quantitative* engineering approach to decision making," he writes (1986, p. 14). Regarding artifacts, Truxal states clearly:

> Here we must teach the basic principles of how a device works, and its capabilities and limitations. In addition, historical development should be considered: the scientific, technological, and cultural settings from which the device evolved, and its impact, both positive and negative (the technological assessment). (1986, p. 17)

But Truxal does not mean knowing how *every* device works nor even how devices from a number of representative groups work. Truxal defends this point and elaborates in the following statement:

> First, technology is conceptually simple—it was de-

> signed by human beings. The system or device may, like a computer, consist of thousands of parts, but each is simple and the designer assembles them with simple algorithms or rules . . . . Second, consideration of any specific technology *(and it makes little difference what the teacher selects)* [italics added] inevitably brings in other disciplines. Technology serves human purposes, so evaluation has to involve both humanities and social/behavioral sciences. Finally, learning technology is fun, exciting, and challenging. (1985, p. 4)

The affective domain plays an important role in developing and in demonstrating technological literacy. After teaching several literacy courses to liberal arts students, the author has discovered that many students are not interested in understanding technology and do not think they *can* understand it. Students with this mindset usually show the same attitude toward mathematics and science. Overcoming this attitude and replacing it with a desire to learn about and use technological concepts became an overriding objective in the courses. Unless a person has an interest in studying and attempting to understand a technical issue that is affecting or will affect him or her, that person could hardly be considered technologically literate.

Rationale for Technological Literacy

At the second Science, Technology and Society (STS) Conference, George Bugliarello explained the need for technology education: "We are a nation of technological illiterates, at risk in industry, in defense, and indeed in our culture. If we are to maintain our competitive position in the world, technological literacy must be accorded top national priority" (Kreiger, 1987, p. 27).

Stephen White, Special Projects Director for the Sloan Foundation, was basically responsible for directing a substantial amount of Sloan's efforts and money into what is now called the New Liberal Arts Program. He reflected on the reasons that Sloan got involved in technological literacy programs:

> Higher education in science, technology, engineering, economics, and education for the public service has always been considered by the Foundation to be

> primarily vocational in the best sense of that much-misused word, although an awareness of the humanistic element in pure science stimulated the limited involvement with the liberal arts colleges in the 60s and 70s. The earliest involvement with public management in the 70s was also primarily vocational, and was stimulated by the very considerations that are the central matter of this note: the need for analytical skills and technological literacy in the preparation of students for the public service.
>
> Once the entry had been made into the support of education for the public service—and it was a major step, in which the Foundation has so far invested $11.3 million—there immediately followed a recognition within the Foundation that since all citizens are involved, however remotely, in the public service some kind of education in public policy analysis and the technological aspects of analysis could be construed to have a place in the liberal arts curriculum. (1981, pp. 8-9)

> The purpose [of the project] has not changed: it is to turn out civilized adults, a few of whom will inevitably become applied mathematicians and technologists and computer scientists and philosophers and historians, most of whom will not. But no adult is truly civilized unless he is acquainted with the civilization of which he is a member, and the liberal arts curriculum of fifty years ago no longer provides that acquaintance. (1981, p. 11)

Friedman, like Bugliarello and White, linked the need for technological literacy to the fate of our country:

> For me, the most compelling reason for technological literacy is the survival of the democratic process . . . . Judgments concerning resources of our nation need to be made by an informed citizenry. Luddism will only strengthen the hand of the technocrats. The issues stretch from MX missile deployment to space travel and we, as a nation, are not prepared for participatory decision making. We need to confront these problems with the vast intelligence that they require. (1980, p. 2)

In an opening statement to this chapter, Bronowski was quoted as saying that we are waiting to become someone else's past—if we give up. The February 22, 1988, issue of *Newsweek* addressed the topic, "The Pacific Century: Is America in Decline?" The featured article was introduced with the statement: "As the year 2000 approaches, Japan and the other trading powers of Asia are moving into position to dominate the world economy. For Americans, adapting to the loss of U.S. preeminence will pose unprecedented challenges" (p. 43). Perhaps no stronger case can be made for a technologically literate citizenry than this. As educators, *we* need to make this case. The evidence seems clear that we are losing ground due in large measure to an educational system that has failed to prepare our citizens for life in the waning decades of the 20th century. According to several measures, the quality of life in the United States is no longer the highest in the world. There is little security in military strength if our balance of trade shows perennial deficits, increasing amounts of our assets are owned by foreign parties, our quality control and inventiveness can no longer compete, and our quality of life is declining as it inevitably will, given the above conditions.

In summary, four points can be made for the inclusion of technological literacy in the education of our youth.

1. The survival of life as we know it depends on our understanding not only of how technology works but also what the cultural and environmental effects of its uses are. The decisions that must be made are too important to our survival to leave them to the specialists whose narrow training and vested interests may prevent them from seeing the whole consequence of their actions. Bensen states the situation like this:

> Never before have we had the 'tools' to create, develop, and attain our ultimate destiny. But even now, to do so will require an openness to new educational proposals. At the center of such educational plans must be the inclusion of the study of technology. (1986, p. 27)

2. Closely related to the first point is the need for a technologically literate citizenry for the welfare of our representative form of government. All citizens participate or should participate in the decision making processes which allow our country to function for the greatest welfare of its citizens. The influence they bring to bear will be based on knowledge and

understanding *or* on ignorance. Truxal put it into these words: "In very direct terms, future college graduates must be able to do such system analysis [the quantitative engineering approach to decision making], or at least to follow such analysis, if they are to participate in decision making" (1986, p. 15).

3. The work force in this country needs people who can understand technology and have the "tools" to solve technical problems. The need here serves both the individual and society at large. Most occupations today interface with technology in one way or another. As Carrel (1987) indicated, different occupations require different levels of technological literacy. (While it is certainly true in the technical sense that an engineer requires a higher level of mathematical literacy than a janitor, this author prefers to use the term technological literacy to refer only to that level of minimum knowledge and understanding that is expected of *all* functioning citizens in our society.) Nevertheless, the labor force at all levels needs to be prepared for a technological world. The current challenge to our world leadership in technology should serve as a mandate.

4. The fullness of our human experience depends on our ability to feel at home in a technological world. Technology needs to be understood for what it is: neither a god to be worshipped nor a devil to be scorned and feared, but a tool to be used for enhancing life. People who do not understand technology often fear it and feel that they cannot have control of their own lives. Truxal summarizes the role of education in dealing with this fear:

> It [the teaching of technology] should not be restricted to students who will be future leaders; most of our students do not fall into this category. As educators, we hope graduates will contribute to the healthy development of society through their individual creativity, their relations with family and friends, their jobs, and their roles as citizens. In each of these directions, the individual interacts with a highly technological environment; education should develop capabilities for lifelong learning in all of the disciplines that contribute to that environment. (1986, p. 1)

Technological Literacy in Undergraduate General Education

The content of a technological literacy course as a part of the general education, general studies, or liberal education component of the undergraduate program can be studied from two perspectives. One can approach the topic by studying the content of courses which are currently being taught. This would be enlightening and fascinating, but would not lead one to a central core of content because of the variety of courses being taught under the rubric of technological literacy. The second approach is to see what leaders write regarding what the content ought to be. Obviously, the section on defining technological literacy has included several definitions which imply what the content of such a course should be. These will not be repeated here.

Sample Programs[1]

General education courses and programs in technology could be grouped into one of three categories based on the self-association or identification of the course or program creator. Does the course originator consider the course to be an STS course? Or an NLA course? Or a course developed independently of any off-campus sponsorship or association? Unfortunately, such delineation is not practical because of the lack of clear differentiation among the sources of course content and the influences of the respective groups.

Whereas the STS programs of the early 1970s focused more on the implications and consequences of science and technology with little interest in technology and how the technologist works *per se*, the NLA focus is precisely on how technologists approach problems and how technology works. The original intent of the Sloan program, however, was not to displace courses in the existing curriculum, nor to introduce new and separate programs, but rather to suffuse and enrich the present liberal arts curriculum with quantitative and technological material (Koerner, 1985, p. 4). In this manner, no liberal arts student could "escape" technology education. But as Koerner discovered, most institutions had taken the more conventional, less threatening approach of adding separate courses. Sloan has not changed *its* goals, however, and is putting considerable money into faculty development workshops in an effort to permeate the liberal arts core.

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[1] Portions of this section have been taken from an article by the author entitled "Technology Education in the Liberal Arts," *Journal of Epsilon Pi Tau, XIII* (2), 16-23.

The STS courses have moved more in the direction of technological literacy since their inception, but the STS promoters see their programs as having separate courses. Roy (1987) proposed that the STS program form the central component of undergraduate general education.

The Sloan Foundation and the NLA spokespersons have identified what they consider to be the key ingredients in the new technological literacy, namely, a problem-solving mode of thinking that utilizes quantitative reasoning, systems analysis, and modeling. In many ways, this mode of thinking parallels that used by engineers, which may explain why a number of the NLA programs have developed on the fringes of engineering programs or have received support from engineers who have liberal arts interests. However, the majority of NLA programs do not have engineers as instructors. In addition to the quantification of problems, the NLA courses attempt to reduce the fear that many students have regarding technology, a fear based on a lack of understanding about how things work. In an earlier quotation, Truxal (1985) noted that the *concepts* of technology can be taught regardless of the specific technology chosen, and a study of technology must *not* be done in isolation but must be done in the context of the society in which it is used. Thus technology education is interdisciplinary.

The view that any number of specific technologies can be used to teach technology has resulted in a plethora of offerings. Henry Petroski, Director of Graduate Studies in Civil and Environmental Engineering at Duke University, suggested several approaches to course content to achieve the goals of the NLA: (a) an engineering methods course which uses case studies, (b) a course on the principles of engineering "to see how the laws of nature and logic place constraints on the relationships between hardware and software—but also to understand that compromises, trade-offs, imperfection, uncertainties, and risks are inevitably parts of the design process," and (c) focus on newsworthy technological issues and analyze them "in considerable, but not inaccessible technical depth" (1984, p. 14).

In a 1985 survey by the Council of Independent Colleges (CIC), responses were received from 195 of 718 institutions regarding technology education as general education. The list of 343 courses was reduced to those that coupled the liberal arts and technology, had a scientific basis and also dealt with technology as a social process (Lisensky, 1985). The 99 courses from the 195 reporting schools which met the requirements for inclusion were grouped into nine general categories:

> Energy, Resources, Environment, Futuristics (19 entries)
> History of Engineering and Technology (7 entries)
> Introduction to Technology/Engineering (13 entries)
> Medical/Bio/Health Technology (7 entries)
> Religion, Philosophy, and Technology (7 entries)
> Science, Technology, and Society (17 entries)
> Systems Modeling/Technology (3 entries)
> Technology and Social Science (14 entries)
> Computers and Society (12 entries) (CIC, 1985).

Course titles in this survey showed tremendous variety: Nuclear Weapons (Amherst, MA); Inventions That Have Changed Our Lives (Bethel, KS); Computers and Society (Christian Brothers, TN); Systems Design (Cedarville, OH); American Public Policy Formation, Energy and the Environment (Cornell College, IA); Engineering Principles (Dordt, IA); Technology and Alienation (Hamilton, NY); Exploring Alternative Futures (Northland, WI); and 91 other courses.

The CIC compiled another list of technology-related courses in the Sloan programs and institutions (other than CIC Members) in 1985. These course titles were similar to those in the CIC list. Some course titles from the NLA program are: Women, Science, and Technology (Bucknell, PA); Mathematical Modeling (Carleton, MN); Bioengineering and Health Technologies (Davidson, NC); Topics in Physical Technology (Grinnell, IA); Technology, Culture and Values, The Soviet Model (Lafayette, PA); Music Technology, Present and Future (Oberlin, OH); Decision Making and Contemporary Problems (Union College, NY); "Dilemmas", Technology and Social Impact (Wellesly, MA); and, Reproductive and Genetic Technologies (Williams, MA) (Council of Independent Colleges, 1985).

A study by Gruen (1985) of the 235 American Council on Industrial Arts Teacher Education (ACIATE) institutions found that 71 of the 111 respondents stated that their campus had a technology course exploring the social/cultural impact of technology on man and society. However, only 38 of these indicated that the course had been accepted for humanities credit or undergraduate general education. The course titles were not substantially different from those listed in the previous paragraph.

Space does not permit the inclusion of an NLA course syllabus, but two brief descriptions will be made for the sake of illustrating the contents of such courses. The Technology Studies 100 course at Wellesley College introduced students to probability, statistical modeling, and cost-benefit analysis, and exposed them to one or two more specific technologies and to the scientific principles behind them. For their term project, students were asked to design a system to heat the college's art museum. To do that, they obviously needed to know something about thermodynamics and heat transfer (Kanigel, 1986).

Williams College reported a course in forensics science, the discipline using tools of science to solve crimes. Considerable applied science and technology was taught in the course, but, since non-science/non-technologist students are generally afraid of laboratories, Professor Lawrence Kaplan made the laboratory optional. Nevertheless, over half of the 45 students signed up for it (Kanigel, 1986).

Several institutions have developed large enough programs to offer a minor or major in technology. One of the largest of such programs which offers a broad range of exciting courses is the Values, Technology, Science, and Society program at Stanford. Another popular program is the program in technology for liberal arts students at SUNY at Stony Brook. Stony Brook courses are grouped under three categories: introductory courses, upper-division specific technology courses, and seminar/project courses. While none of the courses is required in the general education program, about 70% of the liberal arts graduates take at least one offering. Truxal's Socio-technological Case Studies course typically fills to its maximum enrollment of 500 students. Directors of this program as well as faculty members from Brown and Penn suggest that the popularity is based on several factors:

> 1. The courses deal with topics perceived by the student to be important in both later life and career.
>
> 2. The teaching emphasizes not only a study of a problem or issue, but also consideration of possible constructive actions. In this sense, the focus is strongly on how individuals and the public can influence and control the future.
>
> 3. The courses emphasize active student participation wherever possible: e.g., student use of the real-

> world environment as a laboratory and students involved in original analysis and design.
>
> 4. While the courses are offered from the engineering college, they are as inevitably multi-disciplinary as technology itself. Throughout the program, primary emphasis is placed on the study of how the technology matches human characteristics within economic, social, and ethical constraints.
>
> 5. Faculty have designed the courses so they depend on very little math and science background, even though significant amounts of math and science are taught as required to understand the characteristics and limitations of the technology. (Truxal and Visich, 1987, pp.25-26)

In the same report, the goal of the Stony Brook NLA program is articulated; it is perhaps more in the affective domain than in the cognitive domain:

> The broad educational goal of this Department is to give all students the self-confidence that they can learn a particular technology when the need arises, the realization that such learning is personally rewarding, and the awareness that the development of technology can be controlled by the public. As Bob Wheeler of Yale has repeatedly emphasized, we above all want to teach our students to be nonsense-detectors—to question simplistic arguments (whether pro-or anti-technology) and to view issues from a broad, non-disciplinary vantage point. (Truxal and Visich, 1987, p. 27)

This is in rather sharp contrast to the position taken by our own profession in which the content has been rather clearly identified. Generally accepted criteria were published by the International Technology Education Association in 1985. These include:

> 1. Conduct organized technological study by systems, concepts, and processes.
> 2. Teach students about technology's development and impact on people, the environment, and culture.
> 3. Draw instructional content from one or more major systems such as communications, construction, manufacturing, and transportation.

> 4. Let instructional objectives stress that students will know and appreciate the application of technological concepts, processes, and systems; will apply tools, materials, processes, and technical concepts safely and efficiently; will apply skills, creative abilities, positive self-concepts, and individual potentials in technology; and will solve problems and make decisions involving human and material resources, processes, and technological systems.
>
> 5. Give instructions through concept-based laboratory experiences.
>
> 6. Prepare students with an understanding of how things work as well as with functional technical skills. (Hughes, 1986, p. 28)

Still, questions remain. Are the criteria enumerated above for all levels of technology education? Which parts of the content and objectives above are appropriate for the liberal arts student? Have the objectives been clearly defined for college level general education?

Program Analysis: Similarities and Differences[3]

A useful beginning point for evaluating the implications of the New Liberal Arts for industrial education is to examine the similarities and differences between the two approaches to technology education and pose key questions for industrial education. Table 1 compares and contrasts distinguishing features according to significant educational aspects. The Illinois Plan for Industrial Education (Illinois State Board of Education, 1983) is used as an example of a contemporary industrial education program. The New Liberal Arts was chosen for this illustration because of its clearly articulated goal of technological literacy.

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[3] Major portions of this section appeared originally as "Teaching Technology As a Liberal Art," in the *Journal of Industrial Teacher Education, 25* (1), 7-16, and are used with permission.

Table 1

Analysis: Industrial Education and the New Liberal Arts Program

Aspects	**Industrial Education**	**The New Liberal Arts**
School level and primary content	K-5: Awareness of industrial technology 6-8: Explorations of industrial situations 9-10: Orientation to industrial technologies 11-adult: Problem-solving in technological society; vocational education	13-16: Understanding technology, quantitative reasoning and problem-solving
Technology	6-10: Communication, energy utilization, production (manufacturing & construction) transportation	Technology in any field: music, intracity transportation, nuclear power, television, architecture, supermarket, biotechnology
Type of laboratory	Specially equipped for technology area	Community is usually the "lab;" limited use of science or engineering labs
Teacher preparation	Industrial teacher education preparation	Any discipline; information about technology is gained by self-study and workshops
Place in the curriculum	Separate department with specific courses and separate facilities	Goal: to be incorporated into existing courses to address technological issues in every discipline. Practice: a new course is usually initiated and taught

(Continued next page)

Table 1 (Continued)

Analysis: Industrial Education and the New Liberal Arts Program

Aspects	Industrial Education	The New Liberal Arts
Learning	Newer programs are more cognitive; traditional programs are behavioral / associative (task analysis, organized, projects chosen to teach processes and skills)	Cognitive, problem-centered, fewer prescribed solutions

1. A number of industrial education programs could have been used for comparative purposes in Table 1. Had the comparison been done with respect to a traditional industrial arts program, the differences between the NLA and the industrial arts program would have been greater. Considerable variety exists in industrial education programs across the country, but considerable variety also exists among the NLA and similar programs. Hence, in the comparison, ideal types were compared, that is, programs that fit the philosophy of leaders in the respective fields.

2. The focus of the NLA is on understanding technology or technological literacy. Although individual courses use a specific technology as a vehicle to teach the concepts of technological literacy, the NLA does not prescribe the technologies. Educators trained in the industrial education tradition are preoccupied with certain technology fields, such as construction, manufacturing, and transportation. Focus on certain specific fields may be legitimate if students are being prepared to work in these fields, but is it necessary to specify the field if the goal is general education?

3. An important component in the NLA programs is quantitative skill including (a) math modeling, (b) probability, (c) games theory, (d) systems analysis, (e) queuing theory, and (f) other applied math processes. These skills are tools of the technologist with which, according to NLA promoters, the liberally educated person should be familiar. Industrial educators have been negligent in not including more of the mathematical tools so central to the practice of technology.

4. A key ingredient in all of the NLA programs is their interdisciplinary nature. Hence, not only is technology studied but also included are the social, environmental, and economic impacts of technology. Industrial educators state the importance of studying the environmental and societal impacts in such programs as the Illinois Plan, but, because of the grade level, the degree of understanding of the complexity of social impact cannot be treated in depth. The interdisciplinary nature of the NLA programs was most often handled through team teaching. Is it realistic for industrial educators to handle alone a subject as broad and complex as technology, or is this consideration limited by economics or other structural factors?

The programs and courses reviewed previously were either funded by foundations or were simply the result of the special interests and efforts of educators. Hence, no articulated program for technological literacy through the different educational levels exists. Like other "literacies," technological literacy consists of basic competencies or methodologies integrated with associated knowledge to help one understand and interact with one's world. The field of industrial education has emphasized its contribution to general education at the junior high level; NLA and similar programs are appropriate for teaching a higher level of understanding at a higher educational level. Hence, teaching technology for general education purposes at the junior high level is not competing with the "new" technological literacy programs.

In the list of the 261 courses with technology content designed for undergraduate general education compiled by the Council of Independent Colleges in 1985, only three courses were taught by industrial education faculty (approximately 15% of the instructors did not specify a discipline). The instructors of the other courses came from disciplines in the liberal arts and engineering. Is the low visibility of industrial education a result of the fact that few independent colleges have industrial education programs?

Conclusions

This paper has reviewed some of the current definitions of technology and technological literacy. In an attempt to provide brief coverage of the current situation, explanations or elaborations of the definitions may not have been adequate. Obviously, those whose statements were quoted were not asked if the statements were being taken out of context or being misinterpreted. The process of clarification is a task that must continue in our journals and in our professional meetings.

Materials were drawn from leaders and programs in three areas: industrial arts/technology education, the New Liberal Arts, and Science, Technology and Society. The future of technology education in the general education program will be influenced by all three of these groups. Currently, our profession has made little impact in this vital area. With our preoccupation on developing an articulated program for the first 12 years of education, most of us have failed to ask ourselves and our profession whether we should expect a higher level of technological literacy for liberal arts graduates than we expect of high school graduates. Many of us have erred in assuming that once a student reaches college, he or she will be specializing, and that our task of providing appropriate general education has been completed.

Strategies for the broader involvement of our profession in college level general education technology courses need discussion. The following points should be considered:

1. Those of us who are technology educators at the college level bear a special responsibility to inform ourselves regarding the NLA and STS programs: their goals, objectives, content, and approaches.

2. We need to examine the Jackson's Mill study and identify the objectives and course content that would be appropriate for all college students regardless of their educational majors. How can we come to terms with the differences between ourselves and the STS and NLA programs? *Can* we ameliorate the differences? *Is it necessary* that we do? Does it not weaken our influence in higher education if we lack agreement?

3. Representatives from our field of study need to continue to participate in conferences such as the national Science, Technology and Society Conferences. In turn, our educators would benefit from presentations by NLA and STS representatives at the professional conferences of the International Technology Education Association, the American Vocational Association, the National Association for Industrial and Technical Teacher Education, and other organizations. We also need to inaugurate and maintain dialogue with representatives from the American Association for the Advancement of Science, the National Science

Foundation, the National Science Teachers Association, the National Association of Manufacturers, and the Association for Supervision and Curriculum Development, as well as other groups in mathematics and social science education.

4. If we can come to some agreement that we need to make such courses more interdisciplinary, we will need to address how to do it. Either we need to strengthen the interdisciplinary component of our graduate programs to prepare teachers to teach undergraduate technological literacy courses or we should plan to team-teach such courses. The literature indicates that a number of technology educators can approach the subject of technology from an interdisciplinary perspective. As educators, we need to constantly remind our students, ourselves, and our colleagues that the liberal arts and sciences and technology education do have a close relationship. Technology does not exist in a vacuum. The structure of departments and disciplines distracts from the fact that our students will live "whole" lives and not compartmentalized, fragmented lives. We need to help them find the connections for the most meaningful and productive lives in a technological world.

5. Resources for the teaching of technology at the college level need to be developed, and lists of existing materials need to be compiled. Course syllabi from other programs such as the NLA programs are available for study. Written material such as the books by DeVore (1980) and Pytlik, Lauda, and Johnson (1978) should be utilized where appropriate.

6. Research activity in the area of technology as a part of liberal education deserves stimulation to determine how and what to teach for technological literacy and how much emphasis is appropriate in different situations.

7. Leaders in our field need to establish a task force to address the issues of outcomes, objectives, content, teacher preparation, and strategy for implementing technology education as general education for the purpose of developing technological literacy for all college graduates. The future of our country depends upon it.

The general education, general studies, or liberal education component of our undergraduate institutions can, in most cases, be seen as following two patterns. One is the smorgasbord or divisional distribution requirement where a certain equality is assumed and all courses are considered to have equal value. The other approach is a core curriculum which consists of composite courses designed especially for general education, courses like "Man and Society," "Introduction to the Arts," or "Science and Moral Responsibility." It seems almost redundant to note that the quality of any of these courses depends upon the effectiveness of the instructors.

Bloom, in his highly debated book, *The Closing of the American Mind*, made this statement regarding liberal education:

> Liberal education flourished when it prepared the way for the discussion of a unified view of nature and man's place in it, which the best minds debated on the highest level. It decayed when what lay beyond it were only specialties, the premises of which do not lead to any such vision. (1987, pp. 346-347)

Are not Bloom's concern and a sound technology course fully compatible? Should not a technological literacy course address a unified view of nature and man's place in it, if "nature" is expanded to include the man-made environment? Since technology has sociological, economic, ethical, and behavioral impacts, technological literacy courses should fit the liberal education mold well.

Technology *is* the new liberal arts!

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TWENTY-FIVE YEARS OF CHANGE (1963-1988) AND ITS EFFECT ON INDUSTRIAL TEACHER EDUCATION ADMINISTRATORS

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Change is constant. Change during the past 25 years in society and technology, higher education, industrial teacher education, and administration has modified the roles of the administrators who hold membership in the Mississippi Valley Industrial Teacher Education Conference (MVITEC). These changes were identified by reviewing the literature, outlining the changes, verifying the outline, and conducting a survey. A two-part survey was sent to 51 active members and 27 associate members of MVITEC.

Active members were requested to complete Part I of the survey, which was designed to collect demographic data about present industrial teacher education administrators and descriptive information about their responsibilities. Thirty-seven of the 51 active members responded to Part I.

Part II of the survey asked both active and associate members to identify five major changes in society and culture, higher education, the industrial teacher education profession, the administrative role, and the characteristics of MVITEC administrators. Thirty-eight of the 51 active members and 17 of the 27 associate members responded to Part II. Results of the survey are summarized and discussed in this report.

The writers are indebted to their colleagues who responded to the survey instrument in such a thorough and excellent manner. Without their contributions, this research could not have been completed, and this paper could not have been written.

Changes in Society and Technology

Unprecedented changes have occurred in society and technology during the past 25 years. These changes have had a profound impact on higher education institutions, and more specifically on industrial teacher education personnel and programs. The world is a markedly different place in 1988 than it was in 1963. Individuals who have had administrative responsibility for industrial teacher education have found themselves constantly adjusting to new demands and circumstances.

The survey instrument asked, "What five major changes in society and technology have taken place during the past 25 years which have had a major impact on higher education?" Respondents most frequently listed these items:

1. Changes in the structure of industry and advancements in high technology. (42)
2. Changes in the economy. (23)
3. Changes in the college or university population. (22)
4. Changes in the perception of education. (22)
5. The computer revolution. (22)
6. Changes in communication. (17)
7. Changes in societal values. (14)

The 42 respondents who mentioned changes in the structure of industry and the advancement of high technology listed such items as the deindustrialization of the United States workforce; changes in the job market and the workplace; the increasing number of women and minorities in the labor force; a greater number of high tech industries; major breakthroughs in areas such as robotics, CAD, CAM, laser technology, and new energy sources; the increase in personnel needed for service related industries; and the need for the continued training and retraining of industrial personnel.

Changes in the economy, cited by 23 respondents, was the second most frequently listed topic. It included statements dealing with increased spending of public dollars; an emerging global society; increased foreign competition in manufacturing and other areas; the federal budget deficit, and the growing trade imbalance.

The 22 respondents who listed changes in the college and university population pointed out the decline of the traditional

18-22 year old college student pool and the reduction of secondary school graduates; the larger number of older students attending college, especially women; the increasing number of international students attending colleges and universities; and the reasonably large number of displaced workers enrolling in college curricula.

When addressing changes in the perception of education, 22 of those surveyed included statements relative to the poor attitude of the general public toward education and educators; the back-to-basics movement and increased high school graduation requirements; the slippage in standards and educational attainment; and the belief that the liberal arts are fundamental to the preparation of an educated person.

Another major change cited by 22 respondents was the computer revolution, which was characterized by the following statements: the availability of computers for the general public; the use of computers in all phases of life and areas of study; and the importance of the computer in increasing the documentation and recording of data.

Changes in communication were acknowledged as a major area of change by 17 respondents. Included in their lists were such descriptors as satellite communication leading to instant world communication; a communication oriented society; and ready access to knowledge and information.

Finally, changes in societal values were cited by fourteen respondents who included such factors as the "me" emphasis; the career orientation of the college student population; the Vietnam conflict and the associated alienated youth syndrome, which impacted higher education in such areas as lowering academic standards, grade inflation, and increased confrontation with the establishment; and demanding greater relevancy in university courses.

Other changes cited by fewer than 14 respondents were: greater emphasis on affirmative action; increases in national defense spending; and major reports of commissions, panels and agencies on recommended reforms in education.

Changes in Higher Education

Just as society and technology have changed dramatically over the past quarter of a century, so too has higher education changed. Since our educational institutions are but reflections of the larger society, this comes as no surprise, and in fact, is expected. But because institutions of higher learning have traditionally been conservative in nature and somewhat insulated from the outside world, the events of the past 25 years in higher education have been particularly astounding and far-reaching in their impact.

In the early 1960s a number of former normal schools, subsequently titled state colleges, were beginning to be called state universities in many areas of the country. Even though the names of the institutions changed, many of the programs and personnel did not change, and a large number of them still had as their primary mission the preparation of elementary and secondary teachers. Enrollments in teacher education soared, just as the elementary and secondary enrollments increased with "baby boom" students. Large numbers of students graduated from college and many new school facilities were built. Schools began to diversify their offerings, but in many cases, not before the market for teachers was glutted from the overabundance of recent teacher education graduates.

In the 1970s, college enrollments began to stabilize, and in some cases even to decrease, as the "baby boom" came to an end and elementary and secondary enrollments continued to falter. Money for education became tighter. There was greater competition from other social programs for funds. Tuition costs escalated with rising inflation. With tighter budgets, some educational programs were curtailed or eliminated and other cost cutting measures were invoked. Collective bargaining agreements increased along with faculty loads, as well as the use of computers to assist in administering the institution.

The 1980s have been characterized by increased enrollment caused by a "baby boomlet," an increase in non-traditional students, and the increasing realization that a college education is considered more of a necessity than ever before. It has also been a period of Madison Avenue marketing efforts, and intense competition between and among universities, colleges and departments. Federal support for higher education has continued to decline and tuition costs have continued to go up. Graduation requirements have been increased. Strategic planning, administrative realignments, professional development, and accountability have been buzzwords of the decade.

MVITEC members were asked to respond to the question, "What five major changes within higher education have taken place during the past 25 years which have had a major impact on higher education administration?"

The seven areas of change cited in the order of greatest frequency by the respondents were:

1. Financial support and increased costs. (48)
2. Administrative style/approach. (25)
3. Faculty workload. (23)
4. Accountability. (18)
5. Collective bargaining. (15)
6. Faculty composition. (15)
7. Emphases, goals, and purposes of the university. (14)

The most frequently mentioned change in higher education, financial support and increased costs, was indicated by 48 respondents. Their responses were characterized by these statements:

1. Increased emphasis in deriving financial support from other sources.
2. Reduction in financial support for programs.
3. Lack of adequate budget to meet existing needs.
4. Increased emphasis on revenue generating sports.
5. More competition for limited resources to keep programs current.
6. Decline in federal support for higher education.
7. Increased costs for equipment, contractual services and supplies.
8. Increased tuition costs.

The second ranked category in the list of major changes was the change in administrative style or approach. Responses included some very revealing statements by both former and currently active industrial teacher education administrators. Representative of the responses provided are the following:

1. Use of corporate model (line-staff; top-down) administra-

tive style.

2. A growing adversarial relationship between faculty and administration.

3. Less communication from higher administration to faculty unless the communication is in the form of a directive.

4. The decreasing role of the department head in budgeting, decision making, and program development (25 years ago the strong head, 18 years ago the elected leader, 7-10 years ago the leader appointed by the dean or elected by faculty).

5. An increased amount of detailed information which is expected to be maintained in a database system.

6. A shift from a collegial operation to a more businesslike, bureaucratic, data-based structure.

7. More faculty governance, which may have involved unionization.

8. Rapidly rising salaries of administrators.

9. Hiring of university administrators who don't know how to administer a university.

10. Use of computers to monitor finances, schedule students, maintain student records, register students, and create a database for making decisions.

Change in the faculty workload was cited by 23 respondents whose feelings are captured by the following statements:

1. The workload has increased.

2. Increased emphasis on research and scholarship.

3. Increased requirements for reappointment, tenure and promotion.

4. Less emphasis on teaching as the first priority.

5. Administration doesn't seem to place as much value on student learning, teaching, and advising.

In fourth position among the changes indicated by the respondents was accountability. The term, accountability, has been associated with increased reporting, additional paperwork, and greater expectations of higher education by external agencies. Respondents contributed the following statements:

1. Increased importance being placed on "outcome assessment" or "value added."

2. Growing concern for productivity and cost accountability.

3. State, board of regents, and general public placing more demands on higher education.

Collective bargaining was viewed as a major change in higher education by fifteen respondents. Interestingly enough, when 37 current industrial teacher education administrators answered the question, "Is your faculty unionized?", only nine responded "yes" while 29 replied "no." Statements made by the respondents in the category of collective bargaining indicated that unionization has:

1. Created less collegiality.

2. Caused a more militant faculty.

3. Changed faculty participation governance models to collective bargaining units.

4. Changed the attitude of faculty and affected the procedures for supervising faculty.

Changes in faculty composition were also cited by 15 respondents who provided some varied and interesting responses. The following are indicative of the ideas expressed in this category:

1. It is difficult to obtain salaries to attract and retain qualified faculty members.

2. Faculty salaries are too low to be competitive for qualified faculty.

3. The reassignment of faculty.

4. The impact of affirmative action has regulated the search process (death of "good old boy" network).

5. Internationalization of faculty has increased, especially in highly technical areas such as science, mathematics, computer science, engineering, and technology.

Fourteen respondents identified certain forces and factors related to changes in the mission and goals of the university. Among the statements were:

1. Program growth is of utmost importance.

2. An unclear mission; a multi-faceted set of goals.

3. Public relations and marketing have become more important.

4. Change from a teacher education institution to a professional university.

5. An increase in the number of majors or programs.

Other changes mentioned by numerous respondents were: enrollment requirements; general education or liberal arts requirements; curriculum; and the increased number of computer courses.

Changes in the Profession

The period under consideration began with a startling piece of legislation known as the Vocational Education Act of 1963. The Act represented a philosophical change from the earlier Smith-Hughes Act and brought the areas of vocational education and industrial arts closer together. It also provided monies for conducting research in both areas, and, along with the Vocational Amendments of 1968, provided the impetus for many of the curriculum projects of the 1960s. These projects, also supported by other federal, state and private sector funds, made important contributions to education and led to greatly expanded programs of industrial arts at all levels.

The 1960s also saw a period of unprecedented growth in industrial teacher education as the colleges and universities attempted to produce sufficient numbers of baccalaureate, masters, and doctoral graduates to meet the increasing demands for teachers. At the same time, departments which traditionally had a single purpose, teacher education, became multi-purpose departments as non-teaching programs in industrial technology were introduced. These programs, which started rather slowly, increased in size and status during the latter half of the period. Relatively few industrial teacher educators held earned doctoral degrees in 1963. This condition changed rapidly, however, and today the overwhelming majority of full-time faculty responsible for industrial teacher education hold the terminal degree. During the late 1960s, summer institutes were designed and implemented by a number of universities in cooperation with the U. S. Office of Education to provide advanced study for industrial arts personnel under the auspices of the National Defense Education Act and the Education Personnel Development Act. Teacher fellowship programs were also introduced during this time to provide another means of support for individuals who were preparing to become industrial education teachers.

The 1970s were characterized by both highs and lows. At the turn of the decade, enrollments in most industrial teacher education programs soared to all time highs as the demand for both industrial arts and vocational teachers escalated. Many new area vocational schools and skill centers were built and numerous community college programs were expanded. Industrial teacher education departments were stretched to the limit. Federal, state, and private agency funds suddenly became scarce. Research and major curriculum efforts began to diminish in size and scope as the Vietnam conflict and then the energy crisis drained federal and state budgets. In the last half of the decade, enrollments in industrial teacher education began to fade as fewer openings became available for teachers and as enrollments in the elementary and secondary schools decreased. Budgets were cut and retired faculty were not replaced. A process of program review was implemented and in several instances industrial education programs were among the first on the "chopping block."

At about the same time that the industrial teacher education programs experienced difficulty, industrial technology programs began to flourish and several industrial teacher educators, particularly those who taught laboratory courses, became primarily responsible for teaching and advising industrial technology students. As the decade drew to a close, a very significant development took place: the Jackson's Mill Industrial Arts Curriculum Project, which provided a basis for further curriculum development and unity for the profession.

The 1980s saw the completion of the Jackson's Mill Project in 1981 and a name change for the American Industrial Arts Association, which became the International Technology Education Association in 1985. But industrial teacher education enrollments continued to diminish and technical courses taught by industrial technology faculty increasingly emphasized middle management objectives and content. A resurgence of elementary and secondary education majors, with a corresponding increase in industrial education majors has given some departments renewed hope and encouragement; however, relatively few industrial teacher educators are presently employed to serve them. The recently completed survey of MVITEC administrators indicated that the mean, median, and mode number of industrial teacher educators in each department was four.

When MVITEC members were asked to list the five major changes in the profession in the past 25 years, they provided the following responses:

1. Change in the subject matter base. (29)

2. Change in the organization of the curriculum. (27)

3. Decrease in enrollment. (26)

4. Change from single purpose to multi-purpose departments. (25)

5. Increase in requirements. (25)

6. More emphasis on high technology type courses and programs. (21)

As shown by the frequency of response for each of the six categories of change listed above, there was consistency of response for the significant changes in the profession. This was not the case in the section concerned with society and technology or the one on higher education. It is also interesting to note that most of the statements related to change in the subject matter base and change in the organization of the curriculum focus on industrial arts/technology education rather than on vocational-industrial education.

Respondents cited the following major changes in the category, change in the subject matter base:

1. The shift to technology education.

2. The shift from industry to technology as the content base.

3. The shift from traditional industrial arts content to industrial technology to technology.

Change in the organization of the curriculum, cited by 27 respondents, was characterized by the following:

1. Change from a materials-centered, project-based curriculum area to a process-oriented, problem-solving discipline.

2. The use of the conceptual or cluster approach for organizing the curriculum.

3. The use of communication, production, or manufacturing and construction, and transportation or energy as major curriculum organizers.

4. Change in the content base from the trades to a wider spectrum of industry.

The decrease in enrollment was seen as a major change during the past 25 years by the industrial teacher educators surveyed. Most responses in this category were quite similar, as indicated by these responses:

1. The loss of undergraduate and graduate students majoring in teacher education.

2. The decline in student enrollment in industrial education programs.

3. The reduction in the number of majors who plan on teaching in industrial education.

Tied for fourth place in the number of responses with 25 was the change from single-purpose to multi-purpose departments. Typical of the changes acknowledged were the following:

1. The growth of industrial technology programs.

2. The significant number of students switching to non-teaching programs in departments.

3. The emergence and dominance of non-teaching technology programs, courses, students and budgets.

4. The growth in alternative degree programs in industrial technology, education for industry, industrial science, and technology for industry.

A change in the profession which was cited by 25 respondents was the increase in requirements. The changes in requirements varied considerably, as evidenced by these statements:

1. More mandates, such as courses in mainstreaming, multi-cultural education and the teaching of reading.

2. Teacher certification or competency testing.

3. Reform group reports such as the Holmes Group and the Carnegie Report.

4. Increased entrance requirements.

5. Increase in credit hour requirements for graduation.

6. The back-to-basics movement.

7. More general education requirements.

8. More field experience.

9. A greater need for processing information.

Finally, respondents cited changes related to the increased emphasis on high technology courses and programs. Among the changes included in this area were these recent technological developments:

1. Micro-processor electronics.

2. Computer-assisted design.

3. Computer-aided manufacturing.

4. Robotics.

5. Laser technology.

6. Fiber optics.

7. Computer applications.

8. Synthetics.

9. Participatory management.

10. Statistical process control.

Changes in the Administrative Role

Demographic data supplied by the 37 active members of MVITEC who responded to Part I of the survey instrument may be used to describe a composite, or average, administrator of industrial teacher education. The typical departmental administrator is a 50-year-old white male who holds a twelve-month contract. Eight full-time faculty members, four of whom are industrial teacher educators, are under his supervision. He administers four programs. The administrative unit and its industrial teacher education program are smaller than they were ten years ago. He is a department head, rather than a chairperson or coordinator, and has served as the person responsible for industrial teacher education at his institution for nine years. The faculty is not unionized. He teaches at least half-time. He feels that it is desirable to both teach and administer in his department and does not feel that his teaching load is excessive. Today's typical department head teaches both undergraduate and graduate classes and has been appointed to serve as department head for an indefinite period of time.

Two questions asked of the industrial teacher education departmental administrator were: (a) Has your job as an administrator changed significantly in recent years? and (b) What do you see as the five major changes that have occurred in administering your industrial teacher education program during the past 25 years? Of the 35 individuals who responded to the first question, 24 indicated there was change and eleven indicated there was no change. The respondents were encouraged to provide comments. Representative comments were:

1. Increased bureaucracy and greater centralization, which has caused more layers of authority and the decision making process to slow down significantly.

2. More and more paper.

3. More and more evaluations.

4. The job has become considerably more burdensome with additional administrative approval required from deans.

5. Budget considerations and constraints have become the major concerns; living within budget constraints has made a difference in recent years.

6. Decision-making authority has been moved from the department level to the dean and vice president. Decision making has become much more dependent upon written rationales. The faculty perceive the decision making process as being less

responsible and very time consuming.

7. More pressure related to merit pay, promotion and tenure.

8. More paperwork and demands for accountability. It is harder to get things through the administrative structure.

9. Push paper; no time to be creative.

10. Our student enrollment has shifted from undergraduate to graduate students. A growing percentage of our undergraduate students are preparing for training in industry, not teaching in schools. The focus of the university is on doing less, better: fewer students, but better students; fewer, but better programs; more research directed toward solving society's problems.

11. Much more reporting and paperwork than ever before. More bureaucratic structure makes simple things more difficult. All personnel decisions have become increasingly complex: hiring, reappointment, tenure and promotion. Course and curriculum proposal procedures have become cumbersome.

12. The change of the mission of the university has thrust the division into turmoil. I took over as the change began; thus, my job did not change but the responsibilities of the office have changed.

13. Our department has been expanded from industrial arts/technology education to include all of the following: business and office education, trade and industrial education, marketing education, training and development, and computer applications in occupational education. I asked to be relieved of being the chair and was made coordinator of industrial arts/technology education.

14. Coordinating, managing, monitoring policy rather than policy development.

15. The department has grown in numbers of faculty and students, but we still have one secretary and one part-time administrator to respond to the demands, which include greater and greater efforts in research, inservice, and interaction with the industrial community.

16. More time required for budgeting, planning, and justi-

fying program. More emphasis on outside funding.

17. Added administrators at the upper level of the university have increased the amount of planning, the number of reports, and other writing tasks.

The responses to the question concerning the five major changes that have occurred in the administration of the industrial teacher education program over the past 25 years were grouped into categories. The categories of change appearing with the greatest frequency were:

1. The increase in the time required to administer a department. (28)

2. Changes in faculty characteristics, expectations, evaluation, and organization. (25)

3. Securing financial support and administering budgets. (23)

4. Administering program changes. (22)

5. Administering curriculum change. (18)

6. Increased emphasis on public relations and communication. (15)

Under the categorical heading of increased time required to administer a department, respondents reemphasized the general proliferation of paperwork:

1. Process piles of paper.

2. More paperwork to justify everything.

3. More time administering paperwork and less time administering faculty.

4. Increase in the number of requests for information of all types.

5. More complex.

6. Less time spent on administering, and more time spent on non-related matters.

7. The justification of the teacher education program during periods of enrollment decline.

8. The trend to evaluate everyone.

9. More accountability expected.

10. More demands, longer working hours and less rewarding.

11. Shift from a collegial operation to a bureaucratic mode of operation with more paper work required.

The second ranked category had to do with changes in faculty characteristics, expectations, evaluation and organization. The statements covered a wide range of topics, but generally focused on such items as the unionization of faculty, the increased importance of scholarly activity, the increase in tenure and promotion requirements, and the increase in the number of older faculty members. The following remarks are representative:

1. Unionization of faculty and collective bargaining.

2. Increased emphasis on writing and research.

3. Aging of the faculty.

4. Little chance of getting faculty promoted if they don't have an outstanding scholarship record.

5. Younger faculty are not as committed to teaching or to their employers as they were before.

6. A tightening of the promotion and tenure requirements.

7. There are good and bad effects of merit pay on faculty morale.

8. Increased conflict among demands, expectations, and rewards.

The third major area of change was securing adequate financial support and administering budgets. Most of the respondents who addressed this issue cited the shortage of money as the major problem, although other items were also listed:

1. Doing more and more with less.

2. Funds are more difficult to obtain.

3. The need exists to secure funds from outside sources.

4. Must compete with industrial technology resources.

5. Loss of purchasing power for equipment and supplies.

6. More responsibility, more demands with less funds available.

7. It is difficult to purchase and maintain necessary facilities and equipment.

8. The high cost of high tech equipment.

9. The lack of funds inhibits the ability to change.

10. More varied programs to supervise.

Administering program changes ranked fourth in frequency among the five most important changes. Several respondents singled out the shift in emphasis from industrial teacher education to industrial technology, the reorganization of the unit, and the change in department name to reflect new programs. Responses to this category included:

1. Management of unique programs without the use of an existing model.

2. Identifying a new department name to reflect new programs housed in the department.

3. Addition of new programs.

4. Termination of programs.

5. Less emphasis placed on the importance of industrial arts in the departmental spectrum.

6. Shift from teacher education to non-teaching programs.

7. Completing unit reorganization.

Administering curriculum change, although similar in many respects to the previous category on program change, brought some different ideas. Respondents focused on such topics as updating the curriculum, moving from theory to practice, using the cluster approach, and complying with state and federal mandates. Other representative statements were:

1. The continual revision of coursework to keep up-to-date technologically.

2. Complying with certification requirements.

3. Fitting the revised education program into four years.

4. Updating the curriculum to reflect technology education.

5. Moving from the theory of change to the early stages of implementation.

Fifteen respondents listed statements related to the category of increased emphasis on public relations and communication. Respondents indicated that they were involved to a greater degree with personnel outside their departments in the university community, business, industry, state government, and public school districts. These interactions are reflected in these statements:

1. Communicate with other instructional units.

2. Involvement with local industry.

3. Increased involvement in public school curriculum design.

4. The need to provide more services to public schools.

5. Diffusion and acceptance of curriculum change in secondary education.

6. Faculty have lost interest in promoting teacher education and maintaining public school contacts.

7. The decline in status of the industrial teacher education program in major research universities has resulted in fewer resources.

In the last 25 years, changes in the structure of industry, technology, the economy, the population attending college, perception of education by the general public, societal values, mass communication, and the use of the computer have had effects upon higher education. Changes in higher education, such as increased diversification of academic programs, unstable enrollments, and increased need for external financial support have had a noticeable impact on the role of the departmental administrator or program coordinator. Other changes, such as the increased sophistication of the marketing process, the use of the corporate administrative style, the increased awareness of collective bargaining, and changes in the composition of the faculty have also made a substantial difference in the administrator's role. Industrial teacher education programs have experienced unprecedented growth, followed by a sharp decline in enrollment, the introduction of non-teaching programs in teacher education departments, a reduction in faculty numbers, and the graying of the faculty. Administrators have also had to deal with changes in the subject matter base and curriculum organization of industrial arts, increases in teacher education requirements, and more emphasis on high technology courses and programs.

Changes during the past 25 years have resulted in department heads and program coordinators having less authority, becoming managers responsible for carrying out upper level administrative decisions, and spending a lot of time processing paper work. They are also assuming responsibility for managing and supervising more programs with no additional resources, monitoring policies instead of developing them, and administering program and curriculum changes. Increasing faculty loads and implementing new faculty evaluation standards have added to administrative responsibilities in recent years. The increase in tenure and promotion criteria has resulted in increasing the expected scholarship performance of faculty. This has caused the department head or coordinator to have to place greater emphasis on the evaluation of scholarly activity at the possible expense of teaching effectiveness and/or service activities.

Today, the average industrial teacher education administrator is older than the person who headed the unit 25 years ago, is responsible for a smaller teacher education program, and has assumed more duties with less authority. The increase in multipurpose departments, growing emphasis on accountability, financial exigency, and faculty governance have combined to produce organizational changes and increased the rate of turnover of departmental administrative personnel. A review of the November 16, 1987, roster of active members of the Mississippi Valley Industrial Teacher Education Conference indicates that only 18 of the 51 members (35%) were elected to membership prior to 1980. The December 2, 1969 active membership roster, which was the first roster to include the date elected to membership for each active member, indicated that 21 of the 51 members (41%) were elected to membership prior to 1962. There is reason to believe that a smaller turnover of active members reflected in a larger percentage of long-term members would be evidenced for the early years of the organization, had accurate records been maintained.

Desirable Characteristics of the Industrial Teacher Education Administrator

What type of individual is best suited for the task of administering an industrial education program in the present context? The respondents answered the question, "What five major characteristics or personality traits do you feel are most desirable for today's MVITE administrator?" The responses were indeed interesting and diverse. In order of frequency, the respondents identified these five qualities or traits:

1. Be a leader, a motivator, and set a good example. (44)
2. Be flexible and cooperative. (37)
3. Be personable, approachable and professional. (31)
4. Be articulate and a good communicator. (28)
5. Be persistent and dedicated. (23)

Numerous words, phrases and descriptors were used by the respondents to characterize the qualities which they believed important. Under the leadership, motivator and good example category, the respondents said that today's industrial teacher education administrator should:

1. Be a good decision maker who follows through.
2. Provide and exert strong leadership.
3. Set an example of what is expected.
4. Institute change.
5. Inspire others to do their best
6. Understand and use the rewards that are incentives for faculty members.
7. Identify faculty strengths and capitalize on them.
8. Be a change agent and motivate people.
9. Manage people effectively; motivate and inspire them.

10. Encourage change.
11. Provide support for change to occur.
12. Be an effective role model.
13. Be active in the profession.
14. Be able to attract grants and contracts.
15. Be an effective teacher.
16. Be visible as national scholar.
17. Have research interests and skills.
18. Be concerned with standards and quality.

Indicative of the second most frequently listed category, flexibility and cooperation, respondents felt that today's administrator needed to:

1. Be flexible in dealing with people.
2. Be willing to change.
3. Be versatile.
4. Accept divergent ideas and evaluate them for potential usefulness.
5. Be willing to grow, develop, learn and change.
6. Be willing to re-evaluate a viewpoint.
7. Be firm but flexible.
8. Be able to "roll with the punches."
9. Be able to give people room to do their job.
10. Work well with upper echelon administrators.
11. Work effectively with departmental personnel.
12. Serve as a team member.
13. Be able to work with diverse groups of people.
14. Be able to work in shared governance or union-management systems.

The third category, that of being personable, approachable and professional, was cited by 31 respondents and included the following needed qualities for today's industrial teacher education administrator:

1. Open-minded.
2. Respectful of everyone.
3. Outgoing.
4. Able to demonstrate a good sense of humor.
5. A caring individual.
6. Able to get along well with people.
7. Kind.
8. Friendly.
9. Level-headed.
10. Consistent.
11. Even tempered.
12. Optimistic.
13. Dependable.
14. Objective.
15. Able to differentiate between truth and non-truth.
16. Professional.

A quality identified by 28 of the respondents as being important for today's industrial teacher education administrator was to be articulate and a good communicator. Typical responses indicated that today's administrator should:

1. Be able to communicate effectively both internally and externally.
2. Be a smooth, politically-oriented individual.
3. Be a good public speaker.
4. Use good speech.
5. Possess good public relations skills.
6. Be able to clarify points.

7. Be a salesperson for the department and the university.

8. Possess human relations skills.

9. Be a good listener.

10. Be a good writer.

Persistence and dedication were identified as qualities for achieving success as an administrator by 23 of those surveyed. Among the traits or characteristics listed were these:

1. Be dedicated to the department, faculty and students.

2. Not be afraid of work.

3. Show patience and understanding.

4. Be dedicated to the job and profession.

5. Keep faculty working toward the accomplishment of common goals.

6. Be poised.

7. Have a strong work ethic.

8. Maintain a cool temperament.

Today's members of the Mississippi Valley Industrial Teacher Education Conference have indicated their recommendations for the qualities needed for leadership in departmental administration. Their composite of the ideal departmental administrator would be an individual who is flexible, cooperative, personable, approachable, professional, articulate, persistent, and dedicated. The administrator should be a leader, a motivator and a good communicator, as well as being one who sets a good example.

What Does the Future Hold?

What can be gleaned from the survey results as we look toward the year 2000? If the respondents to the survey are representative of industrial teacher education administrators in the United States, the following assumptions appear to be warranted:

1. There will be a reduction in the number of institutions offering industrial teacher education programs, with a slight

increase in the number of technology teacher education programs in the United States.

2. There will continue to be a greater concentration of programs under one administrative unit. More mergers and administrative realignments will occur as institutions attempt to be more cost effective.

3. Most of the administrators responsible for industrial teacher education programs will have backgrounds in disciplines other than industrial teacher education.

4. The centralization of administrative authority will continue to increase and departmental administrators will have less control in administering their units.

5. The industrial teacher education administrator will be expected to assume more managerial functions, thus having less time for curriculum and program development.

6. The industrial teacher education faculty will assume more responsibility for the teacher education curriculum and instructional program.

7. The success of the industrial teacher education program will depend, in large measure, on how effectively the administrator and faculty plan cooperatively and creatively, implement their plans, market the program, and marshal the necessary resources.

8. Those industrial teacher education units that constantly update their programs, develop and maintain working relationships with other technical teaching and non-teaching programs, and work together to meet common goals will continue to grow.

9. Those updated programs which meet the needs of contemporary society will continue to flourish.

10. There will be greater dependence on external funds. As university general fund budgets become tighter, departments will be asked to do more with fewer resources.

11. Technical teaching and non-teaching programs will continue to share equipment and facilities.

Other assumptions could be made; however, the authors have attempted to: (a) limit the assumptions to a reasonable number; and (b) consider only those assumptions that had a direct relationship to industrial teacher education.

What are the characteristics of the program that will survive or flourish in the year 2000? What kinds of things do we in the profession need to work on in the immediate future?

First of all, it is essential that the programs and curricula be relevant, constantly updated, and consistent with the needs of contemporary society. The curricula must be unique, with objectives no one else can meet as well as the industrial teacher education program.

Second, the faculty and staff must be dedicated to students and committed to the larger goals of the unit. They must be willing and able to work together and focus on appropriate professional problems and issues. They must have high standards and have the respect of the academic community and external agencies.

Third, the departmental administrator, even if from another discipline, must be sensitive to the needs of the program and committed to the preparation of teachers. The industrial teacher education administrator should be creative and possess a leadership style that brings people together. It is imperative that the administrator be a logical thinker and an articulate spokesperson for the program.

Finally, all of the traits and characteristics delineated above will not assure success for industrial teacher education programs unless the department and its programs are viewed favorably by the higher echelons of the administration. Clearly the college or university environment is of the utmost importance to the ultimate destiny of the industrial teacher education program.

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CONCEPTUAL MODELS AND STRATEGIES FOR DEVELOPING TECHNOLOGY EDUCATION

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Conceptual models are used in the development of technology education curriculums because of the power and impact they have in communication. A good model provides an instant overview of what is being proposed, through a quick glance or casual overview. This same model should have the power to cause the reader to look to it for intensive study and to use it as a base for further discussion and debate.

A secondary, yet important, reason for the use of conceptual models is the facilitation they provide to the understanding of relationships between curriculum components within the model. The curriculum developer is able to see the associations that exist between the elements of the proposed study. One of the most difficult sets of information to communicate is the interrelationships among the parts of the curriculum. A model is an extremely powerful tool to foster conceptual relationships.

Models serve several purposes in the curriculum development process: they enhance communication, describe inclusiveness, illustrate completeness, and provide a visual comparison among the various elements of the curriculum.

It is frequently easier to communicate through visual models than through written narratives. Models require less space in the printed material, and usually can be comprehended in less time than is required to understand equivalent content presented in a written description. If the model does not improve communication, the developer should question whether the most appropriate model has been selected.

Models are efficient aids in the validation process. When a conceptual model has been designed to describe a curriculum, that model becomes a useful tool for testing for consistency among the elements in the curriculum. Each part of the curriculum, then, should be demonstrably related to other parts. With the model, it is possible to review curriculum elements for internal consistency. If incongruities are noted, the curriculum can be revised appropriately; if many inconsistencies appear, the appropriateness of the model is questionable, and revisions of the model may be needed.

Models provide information about the inclusiveness or exclusiveness of the concepts included in the curriculum. The model helps the educator identify overlaps between curriculum segments and to note gaps which may remain in the curriculum design.

The magnitude of any human effort, whether in education or in another endeavor, is important to those who are involved. A model can provide a contextual framework for the time requirements of the components and the effort being expended on the educational experiences.

Dimensions of Models

Unidimensional Models

These models order content sequentially for the curriculum developer. They are useful in showing categories of study and enable one to plan a time line for activities. An outline is an example of a unidimensional model. A more sophisticated unidimensional approach is that of a taxonomy, which depicts levels of content within a hierarchical scheme. The following illustration of a taxonomy of technology from work by Paul DeVore (1973) is an example of a powerful model of this type.

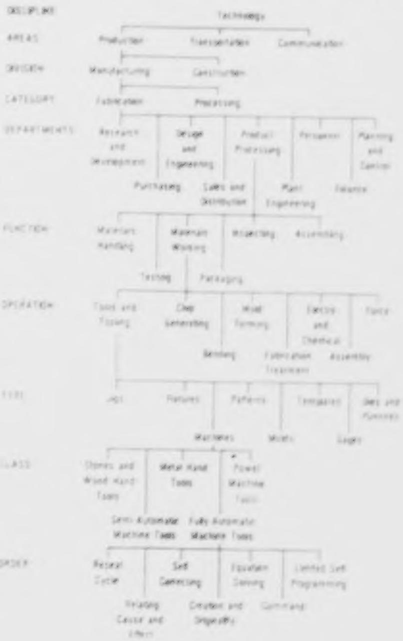
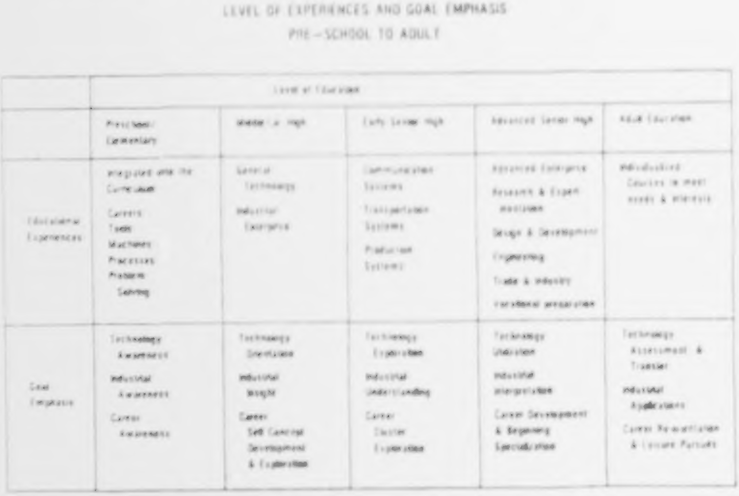

DISCIPLINE
Technology
AREAS
Production
Transportation
Communication
DIVISION
Manufacturing
Construction
CATEGORY
Fabrication
Processing
DEPARTMENTS
Research and Development
Design and Engineering
Product Processing
Personnel
Planning and Control
Purchasing
Sales and Distribution
Plant Engineering
Finance
FUNCTION
Material Handling
Materials Working
Inspecting
Assembling
Testing
Packaging
OPERATION
Tools and Tooling
Chip Generating
Mold Forming
Electric and Chemical
Force
Bonding
Fabrication Treatment
Assembly
TYPE
Jigs
Fixtures
Patterns
Templates
Dies and Punches
Machines
Molds
Gages
CLASS
Stones and Wood Hand Tools
Metal Hand Tools
Power Machine Tools
Semi-Automatic Machine Tools
Fully Automatic Machine Tools
ORDER
Repeat Cycle
Self Correcting
Equation Solving
Limited Self Programming
Relating Cause and Effect
Creation and Originality
Command

Figure 1.
DeVore Taxonomy
Source: DeVore, 1973, p. 12.

Two-Dimensional Models

This type of model has additional usefulness over the unidimensional model. It can show a relationship between two areas of influence in the design of the curriculum. Examples of this type of model are a topology, or what is often referred to as a matrix. Once the two dimensions of the matrix are identified, the subsets within the model are identified. The intersections of the two dimensions of the model become "cells" of activity. A two-dimensional model is an excellent tool to determine whether or not the content in the curriculum is "inclusive." If one of the cells is left open and not addressed in the program, then the curriculum developer knows that work has to continue. The following matrix model, showing levels of instruction and the proposed goal emphasis for each of the levels, is illustrative of ways a two-dimensional model can assist in communication.



LEVEL OF EXPERIENCES AND GOAL EMPHASIS
PRE-SCHOOL TO ADULT

	Level of Education				
	Preschool/ Elementary	Middle/Jr. High	Early Senior High	Advanced Senior High	Adult Education
Educational Experiences	Integrated with the Curriculum Careers Tools Machines Processes Problem Solving	General Technology Industrial Enterprise	Communication Systems Transportation Systems Production Systems	Advanced Enterprise Research & Experimentation Design & Development Engineering Trade & Industry Vocational preparation	Individualized Courses to meet needs & interests
Goal Emphasis	Technology Awareness Industrial Awareness Career Awareness	Technology Orientation Industrial Insight Career Self Concept Development & Exploration	Technology Exploration Industrial Understanding Career Cluster Exploration	Technology Utilization Industrial Interpretation Career Development & Beginning Specialization	Technology Assessment & Transfer Industrial Applications Career Re-evaluation & Leisure Pursuits

Figure 2. Matrix Model of Goal Emphasis
Source: Bensen, 1988, p. 178.

Three-Dimensional Models

These models are closely related to two-dimensional models in that they are developed and constructed in a similar manner. The extra dimension, however, gives even more power to this type of model, since it provides an additional analysis perspective. Usually, these models appear as a cube made up of "sub-cubes." Interrelationships among the parts of the curriculum are apparent from a visual inspection of the model. This type of model was used by the Industrial Arts Curriculum Project (Towers, Lux, & Ray, 1966) and for the "internal cube" of the Jackson's Mill model (Snyder & Hales, 1981).

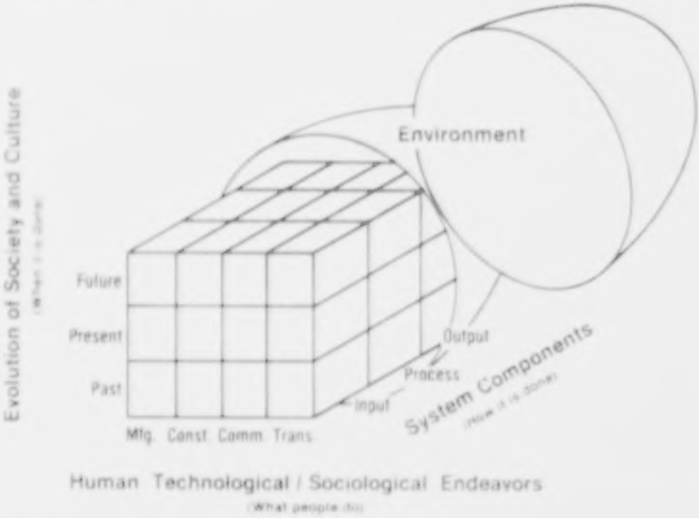

Environment
Evolution of Society and Culture
(When it is Done)
Future
Present
Past
Mfg.
Const.
Comm.
Trans.
Input
Process
Output
System Components
(How it is done)
Human Technological / Sociological Endeavors
(What people do)

Figure 3. Jackson's Mill Model
Source: Snyder & Hales, 1981, p. 7.

Non-dimensional Models

Process models. These models show how something works. As an example, a research and development model can be used to depict the procedures an engineer uses when engaged in an R&D task. The problem solving process may also be illustrated by a process model. A good example of a course designed around a process model is the Research and Experimentation Program of the Maryland Plan (Maley, 1986).

Analogy models. These models are not frequently used in technology education, but they have potential value for the field. By using an analogy to an identified technical human endeavor, we can use the experience of others to provide clues for curriculum design. For example, using the analogy of the procedures involved in the effective operation of an architectural firm or a land-use planner can provide a model upon which to build an analogous curriculum.

Another example of the use of an analogy model is the Jackson's Mill model shown in Figure 3. Its three-dimensional cube is placed within an "environment" that is illustrated by an opened "eggshell." The power of this combination model is such that one can grasp what is being communicated by the illustration in seconds, while it might take a chapter or two to present an equivalent narrative description.

The diagram used in the interaction model of the Jackson's Mill curriculum outline is an example of another powerful analogy model. The diagram makes it possible to illustrate proportional overlaps among the "rings" to provide a clear analogy of how the areas of content overlap and interact.

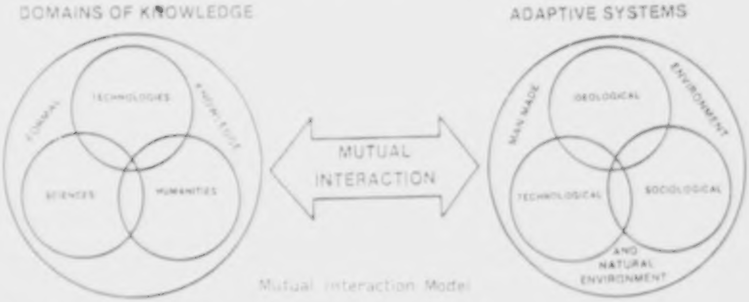

DOMAINS OF KNOWLEDGE
ADAPTIVE SYSTEMS
FORMAL
KNOWLEDGE
TECHNOLOGIES
SCIENCES
HUMANITIES
MUTUAL
INTERACTION
MAN MADE
ENVIRONMENT
IDEOLOGICAL
TECHNOLOGICAL
SOCIOLOGICAL
AND
NATURAL
ENVIRONMENT
Mutual Interaction Model

Figure 4. Jackson's Mill Interactive Model
Source: Snyder & Hales, 1981, p. 18.

Dynamic-static characteristics of models. This aspect of a model can be superimposed over other segments of the model. For instance, a two-dimensional matrix model usually appears in a static state. A dynamic model illustrates change which is occurring in the model itself. It suggests the direction of change, the rate of change, and the focus of the curriculum in the future, in addition to illustrating the current situation.

Organizers for Technology Education Models

Trade-based cluster models. One of the typical approaches in curriculum development is the identification of "clusters" of content around a common area of skilled trades. An example of the cluster model is "construction." This model takes tasks that are performed by carpenters, plumbers, masons, electricians, roofers, and other workers in the construction trades and organizes those tasks into a construction curriculum. It is then possible to teach the "cluster." This model is not mutually exclusive, and many times it lacks inclusiveness, as well. For instance, in many trade-based models, the work of professionals in the field may be overlooked. In the construction cluster, for example, the work of the designer, architect, and construction manager may be overlooked.

Tradition-based cluster models. These clusters of the tradition-based curriculum have similar problems to those described for the trade-based clusters. For instance, a "metal fabrication" cluster might include machining, welding, and sheet metal. However, the tradition-based cluster model may provide little guidance for the educational decisions which must be made regarding the purposes of the program and the selection of specific fabrication processes to be included in the instructional activity. (Bensen, 1979)

Another traditional approach to cluster curriculum development combines traditional industrial arts instructional areas, such as metals, woods, and plastics, and groups them into a "materials" cluster, or a "processes" cluster, or even a combined "materials and processes" cluster. A major weakness in such a cluster as this is that it often ignores other materials, such as ceramics or composites, simply because they were not a part of the traditional areas chosen for the cluster.

Concepts as Models

Concepts bring precision to communication. They have discrete definitions and known boundaries and can provide structure for curriculum development. (Bensen, 1980)

Levels of concepts. Concept levels are important tools for educational design and for learning. A concept can be taught, then it can be set into a higher order concept. Concepts that are dealt with at the second order become very powerful. It is possible to move on to third order concepts, which are built up from combinations of first and second order concepts. It has been said that Einstein was able to think clearly in third order concepts as he looked at the world both in the scientific sense and in the philosophic sense.

Sets and subsets of concepts. At the micro level of concept development, concepts can be subdivided into sets and subsets to provide learning that is both understandable and long-lasting. This approach has proven to be a powerful way to learn, as well as a way to provide a measure of durability and universality to learning in areas that are experiencing unprecedented change.

The conceptual model approach has been used to structure content and build programs in communication, production, and transportation.

Systems Models

These models are both conceptual and multi-dimensional. They are very powerful, and thus they are quite popular among curriculum developers. They are made up of subsystems, which in turn are made up of third order subsystems. The feedback mechanism which is built into the system model provides for self-correction as the curriculum development process proceeds. A portion of the Jackson's Mill curriculum (Snyder & Hales, 1981) and the Curriculum Implementation Project (CIP) (Wright & Sterry, n.d.) used systems models to develop a base for program design. Shown below is one systems model from the manufacturing systems of the CIP.

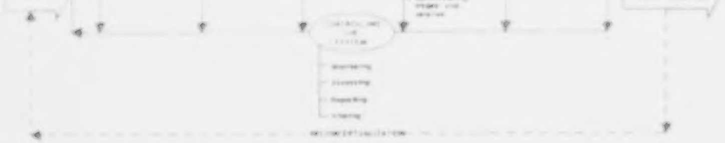


Figure 5. Managed Manufacturing System
Source: Snyder & Hales, 1981, p. 35.

Engineering Disciplines

There is some interest in the use of traditional engineering disciplines as models for the development of programs in technology education. Programs modeled in this fashion contain courses in such areas as electrical, mechanical, and civil engineering.

Integrative Models

Science, Technology and Society approaches. This is a growing area of interest in curriculum building. Traditional school programs are combined in such a way that the learning experiences are integrated in the model. This is a popular model in post high school education. It is supported by such groups as Science, Technology and Society (STS) and the Council on Understanding Technology in Human Affairs (CUTHA).

Integrative arts models. This model gained some popularity at the time of the middle school movement, but seems now to have lost momentum. A typical integrative, or "unified" arts program combines home economics, art, and technology into a single course or program. Sometimes other areas, such as drama and music, may be included to add other integrative experiences for the learners.

School theme models. Some innovative schools have used school themes to serve as models around which to plan learning for their students. Common examples include such themes as "the environment," "energy," "urban renewal," "recreation," "the newspaper," and "enterprise." Only the limitations of the human mind limit the potential of this approach to education. The difficulty, however, is often found in the coordination of the theme throughout the school in a meaningful and efficient manner.

In Conclusion

Models are powerful, useful, and highly valuable tools for the curriculum designer, school administrator, and teacher. This is particularly true in the field of technology education, an area of study that utilizes content which intrinsically promotes the application of models.

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Industrial Teacher Education 1988-2000

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The 1960s saw the emergence of the future as a subject for serious study. Pioneer futurists such as Olaf Helmer at the Rand Corporation, Bertrand de Jouvenal in Paris, and groups working in organizations such as the Hudson Institute demonstrated the importance of such activity. They taught us that the future cannot be predicted and that the future does not await our arrival, but that it awaits its creation. It was through their pioneering efforts that we realized that the creation of carefully selected alternative futures offers the best opportunity to choose and shape our destiny.

Educational systems, like all other social services, should be based on our images of the future. No discipline, including industrial education, is immune to this view. This paper was prepared to provide a perspective for designing futures, which seems to be a far more logical approach than having decisions made simply by default or accident. Industrial teacher education will become what we make it or let it become.

Futurism: Its Role in Educational Planning

During the past decade, the American public has been bombarded with educational reports which have been critical of performance within the schools. These reports have decried the inability of students to cope with rapid change. These criticisms have been levied upon all levels of education, including teacher education. It seems evident that the remainder of this century will not be a tranquil time for our basic institutions. With rapid change as a constant, we will continually be reminded that social adjustment never comes easy. The larger the potential gain, the greater the pressure needed to accomplish it. Thus, we may expect to experience increased need for adaptation if we are to reduce the probability of increased dislocation.

Toffler reminded us that:

> The ultimate purpose of futurism in education is not to create elegantly complex, well-ordered, accurate im-

> ages of the future, but to help learners cope with real-life crises, opportunities and perils. It is to strengthen the individual's practical ability to anticipate and adapt to change, whether through invention, informed acquiescence, or through intelligent resistance. (1974, p. 13)

Decision-making is critical to coping with change and altering direction. Once decision-makers in education realized that they could design the future of their programs, many of them adopted future consciousness. Cuban (1988) referred to first and second order changes in education. First order changes are those which are undertaken to make what already exists more efficient and more effective. Educators subscribing to this method assume that existing goals and structures are adequate and desirable. Second order changes, on the other hand, seek to alter the fundamental ways in which organizations are put together. They introduce new goals, structures, and roles that transform ways of doing into ways of solving persistent problems. First order change is relatively comfortable, since it essentially perpetuates the status quo. Second order change is much more difficult for traditionalists to accept, since it threatens the constants of the past which give stability to the present.

At the risk of overstating the obvious, it should be noted that education should be a rational process directed at achieving identified ends. This implies the establishment of goals as desired and planned results. Spencer (1911) noted that before a rational curriculum can be built, educators must decide which things concern them most; that is, the relative value of knowledge must be determined. Of course, it must also be noted that there is a significant difference between goal establishment and goal attainment. The difference may be evident only after futures planning based on past, present, and anticipated future trends.

Humans can deal with change in a variety of ways. They can resist, ignore, accept, withdraw, or flee. Herbert I. London (1988) presents four conditions that must be evident if one desires to cope rather than resist change. He says:

> Specifically, four conditions must be evident: respect for the past, ability to adapt, confidence in the future, and recognition of the inevitability of change itself. Without these conditions, change can be disabling;

> with them, it can be invigorating, even ennobling. (p. 64)

The future, then, is a resource to be managed. We have to face the consequences of the future so it will be to our advantage to design it well.

Strategy for Change

Curriculum development efforts which are not tailored to the realities of culture have little long-range impact. Rational change with long-range impact is based upon a thorough analysis of the environment from the macro-level of global concerns to the micro-level involving the selection of content and instructional strategies for the individual. Frymier (1973) identified six phases of change in education: (a) awareness of the need for change; (b) conceptualization of a range of alternatives; (c) exploration and consideration of the alternatives; (d) commitment and institutionalization of the proposal for change; (e) preparation of staff; and (f) implementation, evaluation, and modification of the change.

Frymier's six phases combine to form a system with a feedback loop to acknowledge new inputs. In a time of rapid social change, it is critically important to utilize the new information. The potential for what Toffler (1974) calls "overchoice" is an ever-present danger. We can plan rationally if we attend to one basic question: What concepts, values, and ideas will help us act intelligently to adapt to or to resist the future? We must face up to the fact that the knowledge of most worth is, in the final analysis, that which is retained for potential application. To change an educational system in order to present such knowledge requires the willingness to change, in addition to both short-term and long-term flexibility on the part of the individuals who are responsible for managing the system.

Examples of Future Planning

Examples of futures planning may be cited to illustrate the message of this paper. Governmental agencies, business, and industry are heavily involved in such planning; many states and cities have also done extensive long-range planning. One of the most successful undertakings in industrial education has been the *Professional Improvement Plan* of the International Technology Education Association (ITEA, 1986). This long-range plan has provided tremendous help to the leadership in assisting in the direction of the association since 1983. The plan is designed to be self-perpetuating. The high degree of success in using this plan in ITEA has also resulted in successful long-range planning within the councils affiliated with ITEA.

The success of the movement from traditional industrial arts to technology education is directly attributable to the long-range plan of ITEA. It was perhaps the most intensive attempt taken on the part of industrial educators to examine past assumptions concerning the discipline. It was undertaken with an open mind regarding the realities of today and those anticipated tomorrow. While this concerted futures planning effort has been highly successful within ITEA and its affiliated councils, it has yet to mature to the point where other related constituencies in industrial technology and vocational education are infused into the planning process, either directly or indirectly.

Transition into the Information Age

Few futurists would disagree with the statement that humans live at the confluence of more transitions today than have been faced by any previous generation. Society has moved from an agrarian base, where land was the primary asset, to an industrial society based upon mass production, where labor and capital were key assets. The most recent transition is to an information age, where knowledge is the primary asset. Information is self-generating; the more people use it, the more it expands. Countries who have learned to generate knowledge and to apply it effectively find themselves in a distinct competitive advantage in today's world.

Raymond (1986) has identified a third transition, which he expects to last until the year 2045. This era will be based upon artificial intelligence and the application of thought to electronic technology. Information will be interactive and generated continuously. Creativity will be instantaneous and innovation will be spontaneous. Individuals will cross boundaries of their organizations and link with others via an international computer grid. Therefore, they will be able to benefit from the productivity of others in addition to their own productivity.

We refer to a variety of transitions and a variety of labels are assigned to them. What is essential is knowing that today's era and the future are based upon information and technology. Perhaps it might be more appropriate to call it the age of the development of human resources.

A clear indicator of continued growth in the information age is the increase in expenditures for research and development in the United States. Mosbacher (1988) estimated that funding will move from $123.6 billion to $132 billion during 1988, with a 3.1% increase in the real gross national product. This growth will be enhanced by a 9.6% increase in expenditures for new plants and equipment.

Research and development expenditures have increased steadily each year during the past decade. It is anticipated that this trend will continue through the remainder of this century. In such an economy, those industries with a strong commitment to research and development have survived. Those without such commitment have declined or relocated, many to the Far East. Today's entrepreneur can no longer rely upon demand for growth and success in business. The nature of the competition is changing drastically, and the successful entrepreneur must plan carefully to meet the increased challenges arising in the competitive marketplace.

There is a great deal of confusion concerning which skills will be needed in tomorrow's high technology society. Some educational systems have plunged aggressively into high technology programs. Yet, the Bureau of Labor Statistics reported that, by 1995, the high technology industries will employ only 7.7 million workers out of the anticipated total of 123 million employees. ("Jobs of the Future," 1985, December 23, p. 40) Rumberger and Levin (1985) reported that none of the ten occupations with the fastest absolute growth is related to high technology.

In spite of the small number of new jobs in high technology, industry is spending more on educational programs than all 50 states spend on higher education. At least 18 corporate colleges are recognized by state agencies. (Lynton, 1984) Perhaps more than other groups, business and industry have called to our attention the fact that it is exceedingly difficult to create and sustain the conditions under which very large numbers of people become and remain well educated. It is much easier to move capital and technology to new locations.

Compounding the need for education is the fact that approximately 20 million Americans between the ages of 16 and 24 are not likely to embark upon a college education. Between 1979 and 1985, the U. S. suffered a net loss of 1.7 million jobs in manufacturing (William T. Grant Foundation Commission on Work, Family and Citizenship, 1988). While new jobs have been created in the retail and services sectors of the economy, these jobs pay about half as much as those in manufacturing. College-attending persons enjoy the benefits of a post-secondary education that costs an annual $112 billion. Even more important is the fact that this group is the primary beneficiary of the $210 billion per year invested by business and industry for employee training and education.

Industrial educators have always been cognizant of the need to invest resources in non-college bound students. Yet, vocational education in this country is receiving considerable criticism from the industrial community. Such criticism revolves around the notion that the educational system is not delivering programs that provide the requisites needed for success in today's technological world: cognitive skills, motivation, and the capacity for self-direction.

The Carnegie Forum on Education and the Economy noted:

> Much of the rhetoric of the recent education-reform movement has been couched in the language of decline, suggesting that standards have slipped, that the educational system has grown lax and needs to return to some earlier performance standards to succeed. Our view is very different. We do not believe the educational system needs repairing; we believe it must be rebuilt to match the drastic change needed in our economy if we are to prepare our children for productive lives in the 21st century. ("A Nation Prepared," May 21, 1986, p. 44)

Kanter (1983) claims that there is a renaissance in business today that consists of a shift from the development of production systems to the development of people. Perhaps it is time for industrial education to focus upon developing people for lifelong learning rather than on preparing people to participate in the production process. This requires a futuristic approach, one which weaves together societal change with educational change. Harold Shane, noted educational futurist, put it this way: "the challenge is to develop minds that are nimble enough to cope with exponential change" (1986, p. 531).

This discourse leads to two major conclusions. The first is that technological change is coming so fast that society needs an informed populace which is capable of making complex decisions about sustaining the human and natural environment. This does not necessarily include the acquisition of specific technical skills, but rather, the development of a conceptual understanding of how a technological society is structured, how it operates, and how one can cope with its realities.

The second conclusion growing out of this discussion is that business and industry clearly need employees who are proactive. They need individuals who can act independently and with others in group problem-solving activities; who can render critical judgments and offer constructive options; who can use factual information to carry out basic procedures; who can articulate how their factual knowledge is derived and how basic procedures work; who can cope with complicated and unfamiliar problems; who can achieve proficiency with technical means; and, perhaps most importantly, who can handle lifelong learning that merges work with education. The implications for industrial education are vast and must be addressed immediately.

Throughout the rich history of the Mississippi Valley Industrial Teacher Education Conference (MVITEC), attenders have witnessed radical changes in science and technology. Papers presented on numerous occasions have called the attention of the membership to the need for change. In spite of these warnings, recent years have brought concerns about the closing of programs and the failing infrastructure of industrial education.

As an area of study, industrial education seems to be made up of discrete groups, each moving in its own direction, each garnering whatever support it can for its own self-perpetuation. This trend appears to be accelerating. As late as the 1960s, there was at least an assumed link between industrial arts and vocational-technical education. Today, we hear about the variances among these two subject areas, as well as in the relationships of each to industrial technology. Administrators are often confused and forced to make curricular decisions without clear guidance from relevant sources within the profession. Instead, comparative internal enrollment data and pressures from external sources outside the profession are influences which are difficult to resist.

So, we may ask, what would a futuristic approach reveal to be the needs within the boundaries of the disciplines represented in MVITEC? If we restrict our discussion to the areas of study represented in MVITEC in recent years (technology education/industrial arts, industrial technology, and vocational education), we can generate a scenario describing programs designed to meet the needs of our clientele by the end of the century. The scenario is based upon the assumption that educators will refrain from maintaining a morbid preoccupation with the past.

Technology Education

The discussion begins with technology education because it appears that this model is conceptually closest to what business and industry are calling for. Technology education must be a concept-based program, based on the fundamental endeavors of human beings, that is, the use of technical means. Emphasis must be on broad understandings rather than specific skill development. Laboratories comprised of arrays of equipment which learners are expected to master outside the context of technological systems will become learning centers where conceptual learning is emphasized. With an intense emphasis on problem-solving, instructional strategies will become more important than content.

With the sophistication of the technology in the next 12 years and beyond, there must be an increased emphasis placed upon the role of the sciences. A new discipline, Science/Technology Education, will be essential. There is already evidence that such a development might be brought about through joint efforts of ITEA and such groups as the National Science Foundation, the American Association for the Advancement of Science, and Science, Technology and Society. There is now a Science-Technology Week rather than the traditional National Science Week. With a science-based technology driving today's productive efforts, it is essential that there be a merger of the sciences and technology. This will create a new discipline called Science/Technology Education.

This new discipline will create major changes in teacher education programs nationwide. It will mandate a new mind-set on the part of faculty and administration. Facilities will be altered to provide opportunities to study scientific and technological concepts simultaneously. National associations will merge to foster research and provide needed services for educators. Funding at all levels will be restricted to such joint efforts rather than for single disciplines as in the past.

Many public schools will have changed their programs in advance of the revisions in teacher education programs. This will be done through collaborative efforts between the disciplines and private business and industry. By the end of the century, the majority of traditional industrial arts programs will have disappeared due to a lack of student appeal and to the high cost of program operation.

By the year 2000, we will see evidence of programs which have gone even one step further on an experimental basis. These will have a total multi-disciplinary approach, in which the curriculum will evolve around a study of the maintenance and improvement of the natural environment and physical, intellectual, and emotional life. Lessons will deal with existing social conditions. Societal goals will be analyzed, and critiqued. Adjustments will be suggested to meet the goals of the total society. Students will have authentic encounters with the global society as it is and as it can become. Disciplinary lines will be less visible as the total integration of knowledge is realized.

Vocational Education

Change appears to be taking place much more slowly in vocational education, due to a preoccupation with the past. It is essential that programs in this arena focus on specific occupations, but they must also provide much more than the acquisition of technical skills. Business and industry already expect a high degree of technical skills, but place an unusual emphasis upon the ability to identify problems, gather and synthesize data, and engage in rational problem solving. These expectations require changes in content and, most importantly, in the instructional strategies involved.

Vocational education will become much more closely aligned with the model subscribed to by those in technology education. Vocational education will be more concept-based and will be oriented more toward a science-based technology.

Industrial Technology

From its earliest conception, industrial technology was designed to be broadly based and heavily involved with a problem-solving approach. In some cases, these emphases were so pronounced that students were unable to acquire adequate technical knowledge in their programs. Future industrial technology programs will involve much more group activity, an increased emphasis upon technological assessment, and a conscious effort to make all disciplines useful in problem-solving situations. Preoccupation with courses taken out of context will be less evident.

Major changes in industrial technology will include the study of new technical fields such as bio-technology; increased coverage of the impact of scientific and technological decisions upon people, institutions, and the environment; and a closer alliance between industrial technology and the business and industrial sector. These changes will ally industrial technology with technology education in a more harmonious relationship within the university.

Higher Education

By the end of this century, higher education will undergo marked changes. High retirement rates will bring about marked changes in the composition of the faculty. Powerful groups such as the Holmes Group will have significant impact upon curricula and administrative arrangements. Increased accountability will be expected, both in the academic accomplishment of students and in the management of expenditures for instruction and other activities. Interdisciplinary efforts will expand, so that many endeavors will cut across traditional departmental and college lines. Such dramatic changes will mandate an increased emphasis upon strategic planning in a collaborative effort involving administrators, faculty, and staff. Content and instructional strategies will no longer be long-lasting, but may be expected to be in a constant state of flux. The performance of faculty members will be judged by the extent to which they keep up with new technologies and by their ability to coalesce these developments in the classroom.

We will see a renewed relationship between technology education and industrial technology within the universities. This process will give greater strength to both programs and will allow more coherent justification for their roles on campuses. Vocational programs in public institutions and proprietary schools will be highly visible for their renewed ability to deliver educated workers for the needs of contemporary business and industry. In all cases, costs will be reduced through the use of innovative strategies, simulations, and models. Business and industry will become strong advocates, demanding the enhancement of existing programs, the establishment of new programs as they are needed, and the passage of legislation to support needed education in the field. These disciplines will be recognized for their contributions to the economy and to the well-being of all people.

Implications for Future Conferences

As science and technology continue to expand and force social change, our basic institutions must respond. MVITEC is not immune to the impact of the inevitable changes and must respond accordingly. It will do the profession a disservice if the membership fails to respond, or if it responds retrospectively. It behooves all individuals, and MVITEC collectively, to learn to anticipate change and to plan for it. Failure to entertain new ideas would make the Conference unresponsive, obsolescent, and without a rationale for existence. Conversely, a responsive membership can make MVITEC a dynamic force, as it has been since its founding.

Throughout the years, MVITEC has focused on curriculum models, personnel, teacher preparation, interdisciplinary opportunities, facilities, administrative models, unions, general education, and related topics. In the future, these topics will remain viable, but their discussions will require a new focus, one that is responsive to rapid change. Mere reports on "what is" will not suffice. The challenge will be to present new ideas which stretch our imaginations and lead to promising opportunities.

Some topics which will be of paramount importance in the next twelve years are:

Rules Under Which Our Economy Operates

Industrial education has always been directly involved in shaping the economy by providing individuals with vocational skills and a general understanding of technology. It behooves industrial educators to consider the major forces which re-shape our economy in the information age. The Office of Technology Assessment (OTA) has called attention to four major forces which, taken together, appear to open more opportunities than they foreclose. These are:

1. New technologies—primarily those built around microelectronics.

2. The loss of U.S. preeminence in international markets.

3. The possibility that the price of energy and other resources may increase sharply by the turn of the century.

4. Changes in consumer and labor markets and a new attitude toward public regulation of economic activity, resulting—at least in part—from new values and tastes. (OTA, 1988, p. 15)

The MVITEC membership needs to consider these social/technical forces which shape society and must therefore reshape curricular efforts.

Technological Literacy

The call for technological literacy in education, as well as in business and industry, is acute. It has been referred to in many educational reports, including those sponsored by governmental agencies. However, it is abundantly clear that the term, technological literacy, is ill-defined, which makes it difficult to translate into content and instructional strategies. Researchers in higher education need to provide a fresh new perspective for a definition and its implications. Current thinking tends to focus on literacy in production, communication, and transportation. Such a perspective may be too limited and, although viable for technology education, too constrained for other disciplines. The membership needs to continue identifying characteristics of technological literacy by expanding its research base to include the needs of business and industry.

Decreasing Enrollments in Teacher Education

It is evident that some teacher education programs will close in the next decade. Many of those that do not close will experience significant reductions in enrollments. This is due primarily to competition from programs in engineering technology and industrial technology. As a result, there will be a shortage of teachers both in the public schools and in higher education.

One technique for keeping programs administratively viable at a time when teaching load generation is difficult is the merger of teacher education programs with nonteaching programs (i.e., industrial technology or engineering). The basic courses in the study of technology should be the same whether a person is preparing to be a teacher or an engineer. This is especially true as teacher education programs move toward a study of technology rather than the traditional study of materials. Obviously, such a merger raises a host of questions concerning administrative and curricular structures. There are some fine examples of successful programs involved in such relationships. At the same time, there are some programs that have closed because such relationships were not encouraged. Successes and failures need to be presented to the membership.

It is one thing to gain administrative viability, but another to actually increase enrollments in teacher education. Brainstorming sessions are needed to identify additional recruitment strategies which might be attempted. Successful recruitment models need to be identified and considered in MVITEC sessions.

Impact of Science

The sciences have spent a great deal of time addressing the need for technological understanding. This activity will undoubtedly increase as scientists capitalize on the new thinking in biotechnology. Their curriculum materials address this topic, which is strongly advocated by professional associations in the sciences. Unfortunately, this has not resulted in a reciprocal relationship. We function with a science-based technology and there is a definite need for interdisciplinary efforts. If those in technology do not heed this fact, the sciences may well incorporate technology into their disciplines, making industrial education programs for children a thing of the past.

It is possible that a new discipline will be formed, called "Science/Technology Education." In order to accommodate such a structural change, professional associations may find it advantageous to merge. Such developments could lead to a name change for the National Science Foundation, perhaps to the

Science/Technology Foundation.

The status of the sciences needs to be reviewed in MVITEC sessions. Workable relationships between the sciences and technology education need to be explored and considered by the MVITEC membership.

International Education

With the impact of global competition, it is essential that curriculum developers internationalize the curriculum. At the same time, relationships with foreign universities need to be nurtured for faculty/student relationships in teaching and research. Internationalizing the curriculum appears to be nearly totally disregarded in industrial education programs. Presentations on the need for curriculum change and strategies for implementation are definitely needed.

Facilities

As the technologies change, so must facilities, equipment, and supplies. Coping with these needs will continue to be a major problem for administrators. N[illegible]tions need to be explored, such as rental of equipment to meet ad hoc requirements, laboratories that are flexible and meet the needs of teacher education and of other programs. What successful programs can we identify for coping with rapid change?

Name Change for MVITEC

If our society has moved to the postindustrial society or to an information society, is the term "industrial" appropriate for MVITEC or any program in our schools? The membership needs to consider the true meaning of the information age, its impact on people, and its implications for education. Consideration of options could provide fertile ground for debate and action.

Needs of Business and Industry

What are the true needs of business and industry for the next decade? Business and industry must adapt to what Swyt (1986) calls the third, distinctly new postindustrial era. The important question is how educational programs accommodate their needs. Such questions have provided stimulating discussion for MVITEC through 75 conferences, and they must remain important topics in the years ahead. However, it is time that those preparing presentations go to business and industry for answers, rather than doing a status study of programs among the membership.

Social and Technological Change

Technological change brings with it an avalanche of implications for global society. It is clear that many of these changes alter our productive and service enterprises, but of equal importance, they also alter our culture. The new technologies make some systems obsolete while others are revitalized. In both cases, technological change impacts all of us and our environments.

It is essential therefore that industrial educators at all levels address the social/cultural impacts of changing technology. This mandates a conscious effort on the part of curriculum developers, teachers, publishers, parents, and students. This concept has been the most difficult to articulate in the technology education movement, yet it lies at the heart of sound curriculum development. Too few sessions have been devoted to social trends within the Conference agendas. The reader is encouraged to give careful attention to a reading of Chapter 10 of this book, a paper by A. Emerson Wiens, who presents cogent arguments for utilizing technology education as a part of undergraduate liberal education. Wiens concludes that technology is the newest of the liberal arts.

Charge to Presenters

The assignment of topics to presenters must include a mandate for futures thinking. Presenters must not focus solely on a historical perspective, but rather upon future models. Reports on the status quo will not suffice by themselves, but must include a future perspective with potential opportunities for change. New ideas should surface which can lead to new activities for the participants when they return to their institutions.

William Wolansky, in Chapter 2, identified one of the strengths of the Conference as the exposure to new ideas. This tradition must remain, since new ideas represent the lifeblood of future dialogue.

Summary of Suggested Topics

It is evident that socio-technical conditions have reshaped our society, creating new opportunities for the educational system. Curricular decisions can no longer be made on tradition, an analysis of the status quo, or on future projections utilizing inappropriate data. The membership of the Mississippi Valley Industrial Teacher Education Conference needs to spend time researching and presenting the facts concerning the status of the global economy, its use of technical means, and the inevitable social consequences. From such analyses will come appropriate curricular developments and administrative structures.

Industrial education will remain strong so long as the various elements (disciplines) work together cooperatively and capitalize on each other's strengths. It will capture the interest and support of decision-makers so long as it addresses the realities of global society. To do less will result in the loss of programs and a further increase in delivery of programs by business and industry to meet their needs. The membership will lose its right to complain and campaign if it fails to address contemporary change and future opportunities.

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William T. Grant Foundation Commission on Work, Family and Citizenship. (1988). The forgotten half: non-college bound youth in America. *Phi Delta Kappan, 69* (6), 408-414.

MISSISSIPPI VALLEY INDUSTRIAL TEACHER EDUCATION CONFERENCE MEMBERSHIP RULES AND REGULATIONS

I. Membership in the Conference

Following is a statement of the conditions governing membership in the Mississippi Valley Industrial Teacher Education Conference, as adopted December 3, 1927; as amended December 20, 1930; December 14, 1934; November 21, 1936; November 13, 1948; November 14, 1953; November 12, 1964; November 13, 1969; November 10, 1972; November 8, 1973; November 9, 1978; November 13, 1980; and November 10, 1983.

II. General

1. The territory of the Mississippi Valley Industrial Teacher Education Conference shall be interpreted to include the following twenty (20) states: Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee, Texas, and Wisconsin.

2. There shall be five classes of members: Active Members, Active-at-Large Members, Associate Members, Former Active Members, and Former Active Members, Deceased. These five lists combined shall include all persons who have ever been associated with the Conference.

a. Active Members—arranged alphabetically by state;

b. Active-at-Large Members—in alphabetical order;

c. Associate Members—in alphabetical order;

d. Former Active Members—in alphabetical order; and

e. Former Active Members, Deceased—in alphabetical order, with the year of death indicated in each case.

3. Active Membership of the Conference shall not exceed sixty-five (65) members.

4. Active-at-Large Membership shall not exceed five (5) members. They are to be appointed without regard to institutional or professional responsibilities or geographic area, but

should have a great interest in and be willing to be active in the Conference, and should have demonstrated their ability to contribute to the Conference professionally.

III. *Candidacy for Active Membership*

1. A candidate should have immediate administrative responsibility for one or more areas of industrial teacher education or be the designated representative of this field of effort in a state department of education. The institution or agency should be able to document the administrative nature and the permanency of the candidate's position. The candidate should provide documented evidence of his or her ability to contribute to the Conference professionally. Acting or rotating department heads are not eligible for membership.

2. No person is eligible for Active Membership whose teacher education institution or whose state department or executive agency for education is already represented by an Active Member. The Conference Chairman and Active-at-Large members are not considered to be institutional representatives.

3. Candidates for Active or Active-at-Large Membership who meet the qualifications indicated above may be nominated by any member.

4. A Former Active Member who is otherwise eligible may be nominated.

5. Nominations for Active Member or Active-at-Large Member must be submitted to the Conference Chairman on a Membership Nomination Form supplied by the Conference Chairman. The form, with supporting documents, must reach the Conference Chairman by October 1 in order to be considered at the next regular meeting of the Conference.

6. Nominations for Active Members (not Active-at-Large Members) shall be confined to the territory of the Conference as defined in Paragraph 1, under II.

7. A candidate must have attended at least one complete Mississippi Valley Industrial Teacher Education Conference as a guest within the past four years prior to being nominated.

8. In a year when the number of nominations exceeds the number of openings, a waiting list will be established and new nominations will not be acted upon until action has been taken on those carried over from the previous year(s).

9. An Active Member who becomes an Associate Member

due to a change in his or her professional position and who later assumes a professional position that again qualifies him or her for Active Membership will be placed at the head of the waiting list upon request for change to Active Membership status.

10. Any candidate may remove his or her name from the waiting list upon request to the Conference Chairman.

11. Vacancies in the Active Membership shall be filled in the following manner:

a. Not later than noon of the first day of each annual meeting of the Conference, the Conference Chairman shall appoint a Nominating Committee of four Active Members and one Active-at-Large Member to consider those whose names appear on the waiting list or those who have been nominated during the previous year. At least two of the five shall have served on the Nominating Committee the previous year.

b. The Nominating Committee shall consider only those who have been proposed for membership in accordance with the requirements.

c. Candidates shall be considered in the light of all requirements.

d. The Nominating Committee shall present to the Conference at the business session a list of names of those who, in its judgement, should be selected from the waiting list or who have been nominated during the previous year for consideration by the Conference.

e. The Conference shall vote by ballot and a favorable vote by two-thirds of the Membership present (Active Members and Active-at-Large Members) will be necessary for election to membership.

f. New members shall be notified of their election by the Conference Chairman and a report of the election shall be included in the next regular bulletin to all Active and Active-at-Large Members. A new member must be present for his or her induction.

IV. *Members of the Conference*

1. Those persons whose names are now on the Active Membership list are recognized as Active Members or Active-at-Large Members of the Conference.

2. The policy of the Conference is declared to be "Once an Active or Active-at-Large Member, always a member of some class."

3. Former Active Members do not receive Conference mailings. Active Members, Active-at-Large Members, and Associate Members who fail to attend three consecutive annual Conferences will be moved to Former Active Member status.

4. When an Active Member no longer occupies a position which qualifies him or her for active membership, he or she will automatically be transferred from the Active list of members to the list of Associate Members. When it is reported by any source that a member is no longer eligible for active membership for the above reason, the Conference Chairman shall seek verification from the member, or his or her immediate supervisor, in the most expedient manner, i.e., telephone confirmation by the Conference Chairman is sufficient for moving the member to Associate Member status.

5. An Active Member or Active-at-Large Member may be transferred to Associate Membership or Former Active Membership at his or her request.

6. When an Active Member or Associate Member moves out of the Conference geographic area and by that action becomes a Former Active Member, but subsequently returns to the Conference geographic area, that individual must request Associate Member status during the first calendar year of his or her return. If the person returns to assume a position that again qualifies him or her for Active membership, his or her name will be placed at the head of the waiting list upon request for Active Membership status as in III. 9.

7. Participation in the activities of the Conference shall be interpreted to include: Replying promptly to all Conference communications both from Members and from the Conference Chairman; notifying the Conference Chairman promptly of inability to attend any annual meeting; notifying the Conference Chairman promptly of inability to accept any program or committee assignment.

MISSISSIPPI VALLEY INDUSTRIAL TEACHER EDUCATION CONFERENCE MEMBERSHIP ROSTER

September 1, 1988

ACTIVE MEMBERS

STATE/Member	Institution	Date Elected
ARKANSAS		
Jack B. De Vore, Jr	University of Arkansas	1987
ILLINOIS		
Thomas G. Bridge	Western Illinois Univ.	1986
Thomas L. Erekson	University of Illinois	1986
C. Daniel Miller	Illinois State Univ.	1987
Larry D. Helsel	Eastern Illinois Univ.	1985
Edward J. Reinhart	Chicago State Univ.	1981
INDIANA		
Lowell D. Anderson	Indiana State Univ.	1980
Joseph J. Carrel	Purdue Univ.	1975
Donald F. Smith	Ball State Univ.	1983
IOWA		
Trevor G. Howe	Iowa State University	1984
KANSAS		
Rodney E. Frey	Bethel College	1986
C. Dale Lemons	Pittsburg State Univ.	1970
Noel O. Mintz	Emporia State Univ.	1983
John R. Pannabecker	McPherson College	1983
Frederick P. Ruda	Fort Hays State Univ.	1980
KENTUCKY		
Thomas K. Harden	Northern Kentucky Univ.	1987
John Kruger	Murray State Univ.	1985
Roger W. Prewitt	Eastern Kentucky Univ.	1986
LOUISIANA		
James G. McMurry	Louisiana State Univ.	1976

ACTIVE MEMBERS *(Continued)*

STATE/Member	Institution	Date Elected
MICHIGAN		
George W. Ferns	Michigan State Univ.	1982
H. James Rokusek	Eastern Michigan Univ.	1974
MINNESOTA		
David C. Bjorkquist	Univ. of Minnesota	1973
Iver H. Johnson	Mankato State Univ.	1987
D. Thomas Ryerson	State Dept. of Education	1977
Harlan L. Scherer	Bemidji State Univ.	1974
Anthony E. Schwaller	St. Cloud State Univ.	1987
Wade T. Swenson	Moorhead State Univ.	1983
MISSISSIPPI		
Sam C. Cobbins	Jackson State Univ.	1982
Ray J. Davis	Alcorn State Univ.	1986
MISSOURI		
Stephen D. Coffman	Missouri Dept. El. & Sec. Ed.	1987
Robert L. Cox	Southeast Missouri St. Univ.	1984
L. Eldon Divine	The School of the Ozarks	1980
Niel Edmunds	Univ. of Missouri	1973
Orin R. Robinson	Southwest Missouri St. Univ.	1958
Robert L. Stephens	Northeast Missouri St. Univ.	1985
NEBRASKA		
Donnell E. Cattle	Wayne State Univ.	1978
Merlyn L. Gramberg	Chadron State College	1975
Lester Russell	Peru State College	1977
Ronald Tuttle	Kearney State College	1979
NORTH DAKOTA		
Myron Bender	Univ. of North Dakota	1978
OHIO		
E. Keith Blankenbaker	The Ohio State Univ.	1984
David H. Devier	Ohio Northern Univ.	1985
Terry J. Squier	Kent State Univ.	1984
OKLAHOMA		
Jerry R. Brownrigg	Northwestern St. College	1970

ACTIVE MEMBERS *(Continued)*

STATE/Member	Institution	Date Elected
SOUTH DAKOTA		
Leonard D. Edwards	Black Hills St. College	1972
TENNESSEE		
Richard H. Gould	Middle Tennessee St. Univ.	1980
Harry T. Smith	Tennessee Technological Univ.	1979
James M. Yadon	Memphis State Univ.	1984
TEXAS		
W. R. Forkner	Univ. of Houston	1984
Daniel L. Householder	Texas A&M Univ. (Chairman)	1968
G. Eugene Martin	Southwest Texas St. Univ.	1981
L. Dayle Yeager	East Texas State Univ.	1980
WISCONSIN		
Jack Kirby	Univ. of Wisconsin-Platteville	1967
Leonard F. Sterry	Univ. of Wisconsin-Stout	1970

ACTIVE-AT-LARGE MEMBERS

William E. Dugger, Jr.	Virginia Polytechnic Inst. and State Univ.	1983
Jack A. Luy	Eastern Kentucky Univ.	1987
Jack Simich	Graphic Arts Technical Found.	1987
Kendall N. Starkweather	International Technology Education Association	1985
R. Thomas Wright	Ball State Univ.	1987

ASSOCIATE MEMBERS

Thomas J. Barber	Kent State Univ.	1980
David Beach	Indiana State Univ.	1979
Harold Berryhill	Iowa State Department	1978
John L. Bobell	Southern Illinois Univ.	1983
Herman G. Collins	Northwest Missouri St. Univ.	1979
Clyde O. Craft	Eastern Kentucky Univ.	1971
John Erickson	Southern Illinois Univ.	1968

ASSOCIATE MEMBERS (*Continued*)

John T. Fecik	University of Northern Iowa	1982
John L. Feirer	Western Michigan Univ.	1948
James E. Good	Greece Central School Dist. 9076 S. Kings Hill Place, Sandy, UT 84092	1981
Robert C. Harris	Indiana Univ.	1975
Everett N. Israel	Eastern Michigan Univ.	1979
Ronald E. Jones	Univ. of North Texas	1985
Frederick D. Kagy	Illinois State Univ.	1973
William H. Kemp	St. Cloud State Univ.	1968
William J. Lacroix	St. Cloud State Univ.	1980
Norman G. Laws	Chicago State Univ.	1968
Donald G. Lux	The Ohio State Univ.	1961
C. Blair MacLean	Michigan State Univ.	1961
Bryce D. March	Southeast Missouri St. Univ.	1966
Robert O. Metzger	Illinois State Board of Educ. 300 Centennial Drive, Normal, IL 61761	1981
Willis E. Ray	The Ohio State University 56 Westfield Lane, Palm Coast, FL 32037	1979
Ernest N. Savage	Bowling Green State Univ.	1982
Kenneth L. Simmons	Alcorn State Univ.	1980
Jay T. Smith	Jackson State Univ.	1979
Robert B. Sonderman	Eastern Illinois Univ.	1971
Wesley Stephens	McKnight Publishing Co. One Windrush Acres, Rt. 2, Box 245, Bloomington, IL 61701	1973
Jerry Streichler	Bowling Green St. Univ.	1971
F. Victor Sullivan	Pittsburg State Univ.	1979
Wendell L. Swanson	Western Illinois Univ.	1975
Joe E. Talkington	Illinois State Univ.	1970
Robert M. Tomlinson	Univ. of Illinois	1969
Edgar L. Webb	Wichita State Univ.	1971

ASSOCIATE MEMBERS (*Continued*)

A. Emerson Wiens	Bethel College	1972
William D. Wolansky	Iowa State Univ.	1971

CHAIRMEN EMERITUS

William T. Bawden	Illinois State Univ.	1909
Rupert N. Evans	Univ. of Illinois 1842 Maynard Drive, Champaign, IL 61821	1960
Verne C. Fryklund	Univ. of Wisconsin-Stout	1927
H. H. London	Univ. of Missouri 1300 East Jefferson Street, Hugo, OK 74743	1929

FORMER ACTIVE MEMBERS

Benjamin H. Alsip, Jr.	Southeastern Louisiana Univ.	1969
Donald N. Anderson	Mankato State Univ. Star Rte. 3, Hackensack, MN 56452	1964
Herbert A. Anderson	Univ. of Wisconsin-Stout 1001 North Shore Drive, Menomonie, WI 54751	1967
Dewey F. Barich	Detroit Inst. of Technology	1946
E. L. Barnhart	Emporia State Univ.	1958
Roger L. Barton	Texas A&M Univ.	1960
C. Kenneth Beach	Cornell Univ.	1937
William W. Bearden	Kentucky State University	1981
L. H. Bengston, Sr.	Oklahoma State Univ.	1968
M. James Bensen	Univ. of Wisconsin-Stout	1978
Leon Bibb	Austin Peay State Univ.	1954
John D. Bies	Memphis, Tenn.	1976
K. L. Bing	Southeast Missouri St. College	1946
Keith C. Birks	Univ. of South Dakota	1970
Earl B. Blanton	North Texas State Univ.	1955
Elroy W. Bollinger	Univ. of North Dakota	1925

FORMER ACTIVE MEMBERS *(Continued)*

James L. Boone, Jr.	Texas A&M University	1970
Victor L. Bowers	Southwest Texas St. Univ. 911 E. Bluebonnet Drive, San Marcos, TX 78666	1969
William E. Brame	Central Missouri St. Univ.	1985
Harold R. Brenholtz	East Central St. College	1969
Weston T. Brooks	Memphis State Univ.	1969
Charles A. Bunten	Miami Univ.	1968
Marvin G. Burroughs	Northern State College	1972
E. L. Chase	Central State Univ.	1923
Edward M. Claude	Illinois St. Brd. of Voc.Ed.	1953
G. U. Cleeton	Carnegie Inst. of Tech.	1924
Samuel R. Collins	Prairie View A&M Univ.	1972
Franklin Conley	Western Kentucky University	1975
Bryant Crawford, Jr.	Central State Univ.	1980
Beryl M. Cunningham	Bradley Univ.	1956
Walter E. Dukes	North Carolina A&T St. Univ.	1981
J. Barry DuVall	Central Michigan Univ. Dept. of Business, Vocational & Technical Ed., East Carolina University, Greenville, NC 27858-4353	1980
Louis G. Ecker	Central Michigan Univ.	1974
Max Eddy	Purdue Univ.	1965
Neil G. Ellis	Middle Tennessee St. Univ. Lytle Creek Road, Murfreesboro, TN 37130	1973
E. T. Filbey	Univ. of Chicago	1919
Lawrence Foth	Kansas St. Ad. Council Vo.Ed.	1972
G. A. Frecker	Newfoundland Dept. of Educ.	1947
Donald M. Froelich	Emporia State Univ.	1975
Jack A. Fuzak	Michigan State Univ. 4774 Champion Court, Greensboro, NC 27410	1948

FORMER ACTIVE MEMBERS *(Continued)*

Ralph O. Gallington	Southern Illinois Univ.	1957
Gordon Gavin	Mankato State Univ.	1973
Robert E. Goetz	Central Missouri St. Univ. Rt. 6 Box 252, Warrensburg, MO 64093	1965
James F. Griffin	Southwestern Oklahoma St. Univ.	1971
Chris H. Groneman	Texas A&M University 1501 South Glade, College Station, TX 77840	1940
Nelson Grote	Morehead State Univ. President, Morehead State University, Morehead, KY 40351	1956
Allen T. Hamilton	Purdue Univ.	1933
Owen Harlan	Peru NB St. Teachers College	1960
H. L. Helton	Northwestern St. College	1960
Coleman Hewitt	Chicago State Univ. 403 Rugely Road, Western Springs, IL 60558	1956
F. C. Higbee	State Univ. of Iowa	1921
Leo R. Hogan	State Dept. of Education	1971
Fred S. Huff	Western Michigan Univ.	1933
Viron N. Hukill	Univ. of Central Arkansas	1967
DeWitt Hunt	Oklahoma State Univ.	1927
E. Max Hunter	Univ. of South Mississippi	1969
Harry R. Jackson	State Teachers College	1950
Peter A. Jackson	Northwest Missouri St. College	1972
Eckhart A. Jacobsen	Northern Illinois Univ.	1964
Wallace L. Johnston	Amarillo College	1968
Walter B. Jones	Univ. of Pennsylvania	1926
M. Ray Karnes	University of Illinois 909 S. 34th Ave., Hattiesburg, MS 39401	1952
Franklin J. King	Univ. of Missouri-Columbia	1973

FORMER ACTIVE MEMBERS *(Continued)*

Robert H. Kinker	Indiana Univ.	1954
Walter A. Klehm	Eastern Illinois Univ. 1055 11th St., Charleston, IL 61920	1937
J. F. Kolb	National Metal Trades Assoc.	1926
Floyd E. Krubeck	Kearney State College R.R. 2, Kearney, NE 68847	1956
Raymond A. LaBounty	Eastern Michigan Univ. 810 116th Ave., Treasure Island, FL 33706	1961
S. Lewis Land	Pennsylvania St. Univ.	1925
Donald P. Lauda	Cal. State Univ.-Long Beach	1977
L. C. Lindahl	Chadron St. Teachers College	1931
D. L. MacDonald	Lithographic Foundation	1933
E. W. Manzer	Univ. - Wisconsin-Platteville	1925
R. A. McGee	Stout Institute	1925
Paul T. McHenry	State Teachers College	1937
Marcus V. McWaters	S. E. Louisiana College	1965
Warren H. Messman	Kearney State College 3607 Third Ave., Kearney, NE 68847	1972
William J. Micheels	Univ. of Wisconsin-Stout	1954
F. Milton Miller	Univ. of Missouri-Columbia Milton Miller and Associates, 3454 Hovis Ct., Atlanta, GA 30326	1983
James A. Miller	Dept. Ind. Tech. Kearney St Col 1975	
Ernest L. Minelli	Central Michigan Univ. 1203 Highland, Mt. Pleasant, MI 48858	1969
Roland F. Nagel	Northeastern Missouri St. Univ.	1968
Walter B. Nalbach	Western Kentucky Univ.	1957
Lloyd P. Nelson	Ball State Univ. 1409 N. Lorraine, Muncie, IN 47304	1959
Hugh L. Oakley	Murray State Univ.	1948
Delmar W. Olson	Kent State Univ.	1965

FORMER ACTIVE MEMBERS *(Continued)*

A. E. Pagliarini	Minnesota St. Dept of Ed.	1970
F. Theodore Paige	Ohio Univ. 77 Wonder Hills Drive, Athens, OH 45701	1959
Jerry D. Parish	Berry College	1985
Forest L. Penny	Kansas St. College-Pittsburg	1967
E. C. Phillips	Univ. of Missouri	1920
Harold J. Polk	Oklahoma St. Univ.	1970
Charles B. Porter	Illinois State Univ. 1004 Crescent Lane, Normal, IL 61761	1961
Harold W. Porter	Purdue Univ.	1958
M. F. Poyzer	Univ. of North Dakota	1950
William M. Ramsey	Miami Univ.	1964
Stephen V. Randel	Sam Houston St. Univ.	1961
William F. Rasche	Milwaukee Voc. School	1922
Howard Odin Reed	Univ. of Northern Iowa	1954
Dempsey E. Reid	Western Illinois Univ. 1212 West Adams Street, Macomb, IL 61455	1956
Norman N. Roberts	Morehead State Univ.	1969
Walter J. Robinson	Northwestern State Univ. 921 Williams Ave., Natchitoches, LA 71457	1954
Wendell L. Roy	West Texas St. Univ.	1964
Alvin E. Rudisill	Eastern Michigan Univ.	1974
Marion J. Sherwood	Western Michigan Univ.	1924
C. Vernon Siegner	Peru State College	1962
Asbury Smith	Central State Univ.	1947
Loren W. Smith	Central State Univ.	1973
William P. Spence	Engr. Tech. Kansas St. U.Pittsb	1961
Albert R. Squibb	Ohio Univ. 22 Jacobs Drive, Athens, OH 45701	1960
Henry J. Sredl	Oregon State Univ.	1981

FORMER ACTIVE MEMBERS *(Continued)*

Ronald Stadt	Southern Illinois Univ.	1970
Jacob Stern	University of Illinois P.O. Box 327, Oriental, NC 28571	1965
Fred Strickler	Bradley Univ.	1947
James A. Sullivan	Southern Illinois Univ.	1976
Anthony Taglavore	Tennessee Dept. of Education	1979
Benjamin C. Tinnell	East Tennessee St. Univ.	1956
Edward R. Towers	The Ohio State Univ.	1957
Paul J. VanHorn	Univ. of S. W. Louisiana	1961
Richard J. Vasek	Mississippi State Univ. College of Education, Mississippi State Univ., Mississippi State, MS 39762	1971
Edwin S. Voorhies	Middle Tennessee St. Univ. 606 Shawnee Drive, Murfreesboro, TN 37130	1964
Philip S. Waldeck	Ohio St. Sup., Ind. Arts	1949
James C. Warner	Northern Illinois Univ.	1975
Edgar S. Wagner	Ball State University 4501 N. Wheeling Ave., Apt 3-108, Muncie, IN 47304	1975
Marlowe E. Wegner	Moorhead State College	1959
Ralph C. Wenrich	Univ. of Michigan 1217 Baldwin Avenue, Ann Arbor, MI 48107	1950
Ralph W. Whalin	Eastern Kentucky Univ. P.O. Box 392, Eddyville, KY 42038	1941
Alvin M. White	Southeastern State College	1964
G. D. Whitney	Middleville, MI	1964
Lloyd Wiggins	Oklahoma State Univ.	1978
Alvin E. Willems	McPherson College 1422 E. Euclid, McPherson, KS 67460	1971
W. Rollin Williams III	East Tennessee St. Univ.	1972

FORMER ACTIVE MEMBERS *(Continued)*

Harold J. Winburn	Oklahoma St. Dept. of Educ.	1973
John R. Wright	California Univ. of Penn.	1981
Welcome E. Wright	East Texas State Univ.	1956
Lewis W. Yoho	Indiana State Univ. 2227 Poplar Street, Terre Haute, IN 47803	1962

FORMER ACTIVE MEMBERS - DECEASED

		Year of Membership	Date of Death
Lawrence F. Ashley	Chicago Public Schools	1920	Aug 19 1960
Louis A. Bacon	Greenwich, CT	1909	Jun 18 1944
O. B. Badger	Purdue University	1926	
Charles Bailey	Univ. of North. Iowa	1909	May 20 1954
Otho L. Barnett	N. E. Missouri St. College	1952	Sep 5 1979
Willard Bateson	Wayne State Univ.	1978	Sep 16 1987
William T. Bawden	Illinois State Univ.	1909	Apr 27 1960
Charles L. Bell	Emporia St. College	1971	Oct 5 1975
Harry S. Belman	Purdue Univ.	1961	
Charles A. Bennett	Manual Arts Press	1909	Jun 17 1942
W. C. Bicknell	Southern Illinois Univ.	1947	Feb 15 1954
S. A. Blackburn	North Texas St. Univ.	1923	May 1 1964
G. N. Boone		1927	Mar 27 1945
Clyde A. Bowman	Univ. of Wisconsin-Stout	1922	Nov 14 1981
H. H. Braucher	Univ. of Illinois	1919	Jan 8 1956
B. Eugene Brightwell	Missouri State Dept. of Ed.	1968	Mar 22 1985
L. H. Burch	Western Illinois Univ.	1909	Oct 17 1953
George F. Buxton	Univ. of Wisconsin-Stout	1909	Jan 16 1956
C. Richard Cain	Fort Hays Kansas St. Col.	1972	Jul 8 1977
Lowell L. Carver	Iowa State Univ.	1968	Apr 22 1988

FORMER ACTIVE MEMBERS - DECEASED *(Continued)*

		Year of Membership	Date of Death
R. J. Coltharp	Memphis St. Univ.	1955	Dec 20 1974
George B. Cox	Univ. of Wisconsin	1922	
H. H. Coxen	Kansas City, Mo. Pub. Sch.	1926	
Fred D. Crawshaw	Univ. of Illinois	1909	Oct 30 1955
D. J. Crowley	Bowling Green St. Univ., OH	1920	Jun 15 1964
O. H. Day	Purdue Univ.	1919	Jan 8 1963
S. M. Dell	McPherson College	1937	1986
Thomas Diamond	Univ. of Michigan	1934	Mar 5 1962
A. C. Easton	Univ. of Nebraska	1929	Mar 16 1953
A. H. Edgerton	Univ. of Wisconsin	1923	
Emanuel E. Ericson	E. Central St. College, OK	1929	Oct 28 1959
Marion E. Franklin	N. E. St. College, OK	1927	Feb 19 1968
H. L. Freeland		1930	Jun 19 1945
John F. Friese	St. Cloud State College	1930	
Verne C. Fryklund	Univ. of Wisconsin-Stout	1927	Nov 15 1980
H. C. Givens	La. State Trade School	1933	
Everett R. Glazener	Texas A&M Univ.	1950	Sep 8 1981
L. L. Gore	George Peabody College	1933	Mar 16 1964
R. J. Greenly	Univ. of Akron	1932	
Ira S. Griffith	Univ. of Wisconsin	1917	Apr 29 1924
Noel B. Grinstead	Cen. Missouri St. College	1928	Feb 15 1976
J. G. Grove	East Texas St. College	1923	Mar 12 1971
Harry Gunderson	Northern St. College	1957	Nov 25 1970
L. A. Gustafson	Rankin Trade School	1923	Aug 30 1927
O. A. Hankammer	Kansas College of Pittsburg	1952	Jun 1 1967

FORMER ACTIVE MEMBERS - DECEASED *(Continued)*

		Year of Membership	Date of Death
Robert A. Hardin	Univ. of Oklahoma	1953	
Nelson A. Hauer	Louisiana St. Univ.	1950	Jul 2 1981
B. D. Hayes	Colorado State Univ.	1969	1984
W. H. Henderson	FERA, Galesburg, IL		Aug 1951
R. A. Hinderman	Board of Ed. Denver, CO	1932	
Thomas A. Hippaka	Iowa State Univ.	1940	Sep 5 1971
William L. Hunter	Iowa State Univ.	1931	May 23 1939
Clark L. Jackson	Univ. of Missouri	1926	Jun 29 1976
John A. Jarvis	Univ. of Wisconsin-Stout	1952	Oct 6 1984
Ira H. Johnson	Mankato State College	1958	Jan 7 1983
D. H. Kelley	City Schools, Dallas, TX	1923	Jun 15 1930
Doyle Kemper	S. W. Missouri College	1950	Feb 4 1972
Charles R. Kinison	Ohio Univ.	1941	Aug 23 1965
A. V. Larson	Neb. St. Teachers College	1926	Feb 17 1971
Raymond H. Larson	St. Cloud St. College	1948	Mar 5 1979
Merritt Laubach	Indiana State Univ.	1909	Mar 28 1967
Frank M. Leavitt	Univ. of Chicago	1926	May 1 1953
Edwin A. Lee	Carnegie Institute of Tech.	1925	May 13 1966
B. W. Leib	N. E. Missouri College	1932	Nov 11 1959
Robert J. Leonard	Teachers College, Columbia Univ.	1922	Feb 9 1929
Mel S. Lewis	Indiana Univ.	1931	Aug 3 1969
T. L. Lindsey	Peabody Teachers College	1919	Dec 10 1949
A. N. May	Univ. of Kentucky	1931	Sep 20 1944
Arthur B. Mays	Univ. of Illinois	1918	Jul 12 1966
Jesse T. Mays	Morehead St. Univ., KY	1933	Mar 11 1968
James McKinney	American Tech. Society	1919	Apr 1970

FORMER ACTIVE MEMBERS - DECEASED *(Continued)*

		Year of Membership	Date of Death
G. E. McLaughlin	Ohio Univ.	1919	Jul 15 1938
Oscar W. McMurry	Chicago Normal College	1909	Nov 2 1944
John J. Metz	Ind. Ed. Magazine	1927	May 12 1967
H. U. Miles	Southwest Texas St. Univ.	1940	
George E. Myers	Univ. of Michigan	1918	Jan 12 1961
Howard F. Nelson	Univ. of Minnesota	1962	Oct 21 1986
Maurice J. Nelson	Mankato St. Teachers Col.	1941	Apr 19 1976
Adnah C. Newell	Illinois St. Univ.	1920	Nov 2 1944
Louis V. Newkirk	State Univ. of Iowa	1927	Jan 13 1977
Hugh Norris	E. Central St. College, OK	1929	Jul 7 1963
Milo T. Oakland	N. Illinois St. Univ.	1933	1969
Otto C. Olsen	Kearney State College	1941	1976
Joseph W. Paul	Kansas St. Dept. of Ed.	1921	Sep 13 1939
Stanley J. Pawelek	St. Cloud State Univ.	1940	
Arthur F. Payne	Univ. of Wisconsin	1925	May 21 1939
Harry A. Pederson	Univ. of Wis.-Platteville	1946	May 9 1983
L. C. Peterson	Southern Illinois Univ.	1926	Apr 30 1940
Lawrence W. Prakken	Prakken Publications, Inc.	1948	Dec 10 1987
Victor Randel	Sam Houston Teachers Col.	1923	Nov 21 1959
William E. Roberts	Cleveland Pub. Schools, OH	1919	Aug 28 1950
Robert H. Rodgers	Milwaukee Voc. School	1922	Jul 28 1930
V. M. Russell	Univ. of Wis.-Platteville	1931	Jan 2 1955
Walter Sargent	Univ. of Chicago	1909	Sep 19 1927
William T. Sargent	Ball State University	1965	Nov 29 1985

FORMER ACTIVE MEMBERS - DECEASED *(Continued)*

		Year of Membership	Date of Death
Fred J. Schmidt, Jr.	Ball State Teachers Col.	1946	Oct 17 1958
Harry W. Schmidt	Wis. St. Dept. of Educ.	1918	Dec 26 1972
D. M. Schweickhard	St. Dept. of Education	1920	
Lawrence C. Secrest	Northern Illinois Univ.	1956	Nov 30 1963
Robert W. Selvidge	Univ. of Missouri	1909	Nov 16 1941
Adolph Shane	Iowa State Univ.	1928	Sep 15 1960
Albert F. Siepert	Bradley Univ.	1917	Apr 30 1947
G. Harold Silvius	Wayne State Univ.	1946	1981
Orville E. Sink	Ball State Univ.	1927	Apr 6 1968
E. H. Smith	Carnegie Inst. of Tech.	1925	Apr 8 1939
Homer J. Smith	Univ. of Minnesota	1919	Sep 16 1966
Kenneth G. Smith	Mich. St. Dept. of Ed.	1918	Sep 11 1940
L. T. Smith	Western Kentucky St. Col.	1929	Sep 2 1976
Robert E. Smith	The Ohio State Univ.	1954	Nov 23 1962
Heber A. Sotzin	San Jose College	1927	Jan 6 1960
Ray M. Stombaugh	Illinois State Univ.	1937	Jan 26 1967
William E. Stone	The Ohio State Univ.	1920	Jan 19 1956
William D. Stoner	Miami Univ.	1941	Jan 12 1966
E. K. Strong, Jr.	Stanford Univ.	1923	
F. Theodore Struck	Pennsylvania St. College	1924	Nov 30 1943
Ethan A.T.Svendsen	Indiana State Univ.	1969	Nov 27 1979
Ammon Swope	Purdue Univ.	1922	Feb 10 1963
J. W. Thompson	Ill. St. Dept. of Educ.	1930	May 25 1950
E. W. Tischendorff	Kent State Univ.	1952	Jun 14 1974
R. M. Torgerson	Bowling Green State Univ.	1940	Nov 12 1964
O. W. Troutman	Central Michigan Univ.	1919	Mar 30 1933

FORMER ACTIVE MEMBERS - DECEASED *(Continued)*

		Year of Membership	**Date of Death**
Eldon L. Usry	The Ohio State Univ.	1917	Apr 17 1926
Clinton S. Van Deusen	Kent State Univ.	1916	Mar 8 1945
Samuel J. Vaughn	Kent State Univ.		Sep 5 1936
Gordon O. Voss	Univ. of Minnesota	1961	May 28 1967
L. W. Wahlstrom	Parker School, Chicago, Il	1909	Mar 25 1944
E. C. Weaver	Western Michigan Univ.	1927	May 11 1970
G. K. Wells	Veterans Administration	1928	
Clarence L. Wetzel	Western Illinois Univ.	1927	Oct 1970
Wayne Wetzel	Western Illinois Univ. College	1924	Oct 23 1972
E. L. Williams	Texas A&M Univ.	1928	Jun 14 1954
George A. Willoughby	Eastern Michigan Univ.	1929	Feb 24 1962
W. C. Wilson	East Tennessee St. College	1928	Jun 30 1942
William G. Wilson	Chicago State College	1929	Mar 15 1967
Robert W. Woellner	Univ. of Chicago	1918	
Sylvan A. Yager	Indiana State Univ.	1941	Aug 23 1970

SUMMARY:

Active Members	54
Active At-Large Members	5
Chairmen Emeritus	4
Associate Members	35
Former Active Members	136
Former Active Members-Deceased	140
TOTAL	374

INSTALLATION CEREMONY

Comments by

William D. Wolansky

74th Mississippi Valley
Industrial Teacher Education Conference
Hotel Bismarck, Chicago, Illinois
November 13, 1987

Gentlemen, I am pleased to tell you that you have been elected to Active Membership in the Mississippi Valley Industrial Teacher Education Conference. Our fifth Chairman, Dr. Dan Householder, will be presenting you with a copy of our membership regulations. It is important that you pay careful attention to points that relate to membership in the Conference.

Our regulations are relatively brief. Several key points will be of interest to you.

Point 7 in our governing statements reads: "Participation in the activities of the Conference shall be interpreted to include: Replying promptly to all Conference communications both from Members and from the Conference Chairman; notifying the Conference Chairman promptly of inability to attend any annual meeting; notifying the Conference Chairman promptly of inability to accept any program or committee assignment."

Point 3 relates to your active participation in the Conference. An Active Member who misses three consecutive annual meetings of the Conference shall be automatically dropped from Active Membership and transferred to Former Active Membership. At his/her request, however, s/he may be transferred to Former Active Membership.

Bennett (1937) recorded for us this significant reminder:

> The Manual Arts Conference grew out of a letter written by Robert W. Selvidge to Charles A. Bennett of Bradley Polytechnic Institute in 1908, expressing the opinion that there was a great need of an opportunity for the teachers and organizers of manual training to get together in close conference where they might exchange views on questions of vital importance and

> express all of their heresies without being reported in educational papers. (pp. 502-503)

Bennett also added, "The invitation to the first meeting stated definitely that the conference was 'not called to form a permanent organization but merely to help in the solution of problems of great importance'" (1937, p. 503). I found these statements of particular interest because several initial ideas have remained as a foundation of our present-day conferences. Interestingly, the MVITE Conference is not included in the index of Bennett's text.

Perhaps you have observed that this is our 74th Conference. We were organized in 1909 (78 years ago). The first meeting was held on November 11-13 of that year at Bradley Polytechnic Institute.

The Conference essentially has been continuous since 1909. Conference members met every other year for the first four years. They did not meet for four years during World War II. At first, the Conference members met for three days, Thursday, Friday, and Saturday, each year until recent years, when we reduced our deliberations to two days. Economic constraints are not new to this Conference. Invited visitors to the Conference have become an established pattern to reach out to more professionals in our discipline. We welcome their presence and informal interactions. Since all members have to attend one previous meeting prior to being accepted into active membership, we are assured of some visitors at each conference.

The first Conference was called by Dr. T. C. Burgess, Director of Bradley Polytechnic Institute, at the encouragement of Charles Bennett (then at Bradley), R. W. Selvidge of the University of Missouri, and William T. Bawden, then at State Normal University, Normal, Illinois.

The 12 Charter Members were:

1. L. A. Bacon, Public Schools, Indianapolis, Indiana
2. C. H. Bailey, State Teachers College, Cedar Falls, Iowa
3. William T. Bawden, Illinois State, Normal, Illinois
4. Charles A. Bennett, Bradley Polytechnic Institute, Peoria, Illinois
5. L. H. Burch, State Teachers College, Macomb, Illinois

6. George Buxton, The Stout Institute, Menomonie, Wisconsin
7. Fred D. Crawshaw, University of Illinois, Urbana, Illinois
8. M. L. Laubach, State Teachers College, Terre Haute, Indiana
9. Oscar W. McMurray, Chicago Normal College, Illinois
10. Walter Sargent, University of Chicago, Illinois
11. Robert W. Selvidge, University of Missouri, Columbia, Missouri
12. Leonard W. Wahlstrom, Francis Parker School, Chicago, Illinois

Charles Bennett served as the organizing Chairman for the first and second Conferences. At the third meeting, Bennett was elected Chairman and Bawden served as the secretary. These two individuals then made the arrangements and coordinated the sessions as the "Committee of the Conference" through the fourth meeting in 1913. We no longer have a Conference Secretary, however, we do have a Membership Committee. At times we also create ad hoc committees to study important issues confronting this Conference, such as a name change.

In 1914, at the fifth Conference, it was voted by the membership to request the U. S. Commissioner of Education, Dr. P. P. Claxton, to take over the conduct of the Conference. Dr. Claxton designated W. T. Bawden to represent him and to be in charge of arrangements. Bawden continued in this capacity until he left the government service in 1923. At the 14th meeting, the Conference elected Bawden Chairman and then re-elected him each year until he automatically became known as the first "Life Chairman."

Our four former Chairmen have been:

William T. Bawden	1914-1941	(27 years)
Verne C. Fryklund	1941-1961	(20 years)
H. H. London	1961-1970	(9 years)
Rupert Evans	1970-1980	(11 years)

Dr. Daniel Householder was elected in November, 1980, to succeed Dr. Evans as our fifth Chairman. He has already exerted his influence in reshaping the nature and course of this Conference program and maintaining the traditional excellence of session presentations.

There is much significance in the tradition of the Mississippi Valley Conference. To illustrate, I call attention to the evolving changes in the name of the Conference. Perhaps you know that the Conference was originally called the Mississippi Valley Manual Arts Conference in 1909.

C. Kenneth Beach, who became a member of the Conference in 1937 and then later attended for several years as he headed the program at Cornell University, is one person to be credited with the influence that brought about the change in the name of our organization from Mississippi Valley Manual Arts Conference to the "Industrial Arts Conference." This change in name came about by degrees over a period of years as the need for dropping the out-dated term of "Manual Arts" became more and more apparent. It was not, however, until Kenneth Beach laid down an ultimatum "that he had taken his last request to his dean to travel to an outmoded manual arts conference," that the membership decided that tradition must be set aside, and that the name of the Conference should become the Mississippi Valley Industrial Arts Conference.

When Rupert Evans became our Chairman in 1970, he appointed a special committee headed by Professor Ralph Wenrich of the University of Michigan to study our mission and report the need, if any, to change the name and scope of our Conference. After much debate at our Conference sessions in 1971 and 1972, the members voted to broaden the mission and change the name to the Mississippi Valley Industrial Teacher Education Conference.

While the name of the Conference has changed, the approach that has made the Conference unique has remained rather consistent. To illustrate, Robert W. Selvidge at the 25th anniversary meeting in 1934 said, "We are frequently asked, 'What questions have the Conferences settled?'" Selvidge said that this issue represented a mistaken notion of our objectives. One of our traditions has been not to pass resolutions or attempt to settle problems. I will venture to assert that the discussions during the first 25 years of the Conference have done more to settle problems than all of the resolutions passed by all of our related Associations concerned with industrial education. There is much evidence even from the beginning that this Conference has done much for its members:

> The seeds for much of the professional and technical literature through the years have been planted and nurtured at our Conferences.
>
> Many theses for articles have been road-tested at our sessions.
>
> The Conference provides opportunity for us to be subjected to a highly motivating experience during the examination and exchange of ideas that have in turn given direction to our work.
>
> Articles for *The Journal of Epsilon Pi Tau* are selected from individual topics of professional significance.
>
> Research for Conference presentations has frequently been reported at other Conferences and the results quoted in the literature.

You will be pleased to know that our former Chairman, Rupert Evans, made arrangements in 1972 to have the historical records of our Conference placed in the library of the University of Illinois. These records, which date from 1909 to the present, are now available to researchers investigating the work and influence of this Conference. The dynamics of this Conference are reflected by its membership and the major issues confronting this profession. There is now under way another major project to capture the nature, essence, and contributions of this Conference to our profession.

I urge you to be an exporter of thinking that will motivate discussion and strong positions in respect to what needs to be done to bring about desired changes in the *philosophy, goals, content, standards,* and *learning* approaches to industrial teacher education in the United States. I can assure you that Active Members and our Chairman will influence your thinking and leadership abilities.

Our present Chairman, Dr. Householder, will now extend his congratulations on your having become an Active Member, and hopefully you will remain a dynamic and productive member of our Conference. You will also be welcomed by the members around the tables. Congratulations!

Reference

Bennett, C. A. (1937). *History of Manual and Industrial Education. 1870 to 1917.* Peoria, IL: Bennett.